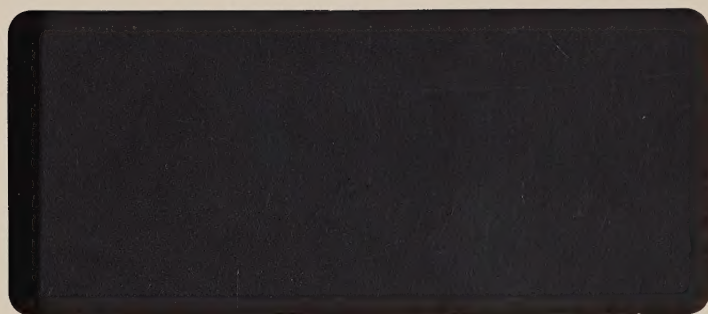


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INSTRUCTION MANUAL

ISOPROBE® ELECTROSTATIC VOLTMETER

MODEL 175 S/N _____

SERIES

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DETECTOR/PREAMPLIFIER PROBE

MODEL _____ S/N _____

Model 612A-1

S/N _____

Model 612A-2

S/N _____

Model 3128-2

S/N _____

Model 3140

S/N _____

Model 3320

S/N _____

Model 3321A

S/N _____

Model 3322B

S/N _____

Model 3356

S/N _____

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LYNDONVILLE, NEW YORK 14098
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P/N 0340046

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Schematics Assembly Drawings and Material Bills:

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Small Signal Board Assembly Drawing	3128-2/1 3128-2/22
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Section 1

SPECIFICATIONS MODEL 175 ± 20 KV ISOPROBE[®] ELECTROSTATIC VOLTMETER

A. RANGE

0 to $\pm 20,000$ Volts DC

B. SPEED OF RESPONSE

Less than 4.5 milliseconds for a 1kV step (10% to 90%) when adjusted for critically damped response with a probe-to-surface spacing of 1/2" (1.3 cm).

Small signal dv/dt exceeds 800 volts/millisecond when gain is adjusted for 10% overshoot.

Large signal response time (10% to 90%) for a 0 to 20kV step (when adjusted for critically damped response) is typically less than 35 milliseconds.

C. FREQUENCY RESPONSE:

Small signal frequency response is flat within ± 3 db from DC to over 60 Hz. when gain is properly set.

D. DRIFT:

Less than 2.0 V/Hr., referred to input, non-cumulative after 1 hour warm-up in an uncontaminated atmosphere at 3 mm probe-to-surface spacing.

E. STATIC ACCURACY:

Better than 0.1%.

F. NOISE (Referred To Input):

Wide-band noise is typically less than 32 volts peak-to-peak or 5 volts RMS. Noise content below 200 Hz. is 24 volts peak-to-peak or 2.4 volts RMS.

G. METER RANGE:

A single range LED digital panel meter covers 0 to $\pm 19,999$ volts.

H. RECORDER OUTPUT:

A low voltage output equaling $1/2000$ th of the input is provided. Maximum range is ± 10 volts.

The output impedance is approximately 100 ohms and is capable of supplying an external load of 1 megohm or greater with negligible loading error. The output is protected against application of external voltages.

An active Chebyshev filter in the recorder output produces a constant delay of approximately 0.6 milliseconds.

I. POWER REQUIREMENTS:

117 or 230 volts $\pm 10\%$, 50/60 Hz., 65 watts max.

J. PROBE DIMENSIONS:

Model 1017 HV probe is 5 1/8" (13 cm.) long and 3/4" (1.9 cm.) in diameter and is provided with a 10 foot (3 M.) cable.

K. SIZE AND WEIGHT:

Size: 12" (30.5 cm) high x 20 1/2" (52.1 cm) wide x 15 3/4" (40 cm) deep.

Weight: 39 lb. 4 oz. (17.8 Kg.)

Panel height is 10 1/2" (26.7 cm). May be mounted in a standard 19" rack.

SECTION 2

INSTALLATION

CAUTION: BEFORE PLUGGING IN, CHECK LINE VOLTAGE SELECTOR SWITCH ON REAR PANEL FOR CORRECT SETTING.

NOTE: WIRE COLOR CODE FOR LINE CORD PROVIDES

HIGH SIDE OF LINE	-	BLACK
LOW SIDE OF LINE	-	WHITE
SAFETY GROUND	-	GREEN

A. PROBE PURGING:

1. The use of a gas purged probe is recommended for all applications where the environment is contaminated, volatile, specially controlled, or any other application where it is desirable to control the probe's exposure to environment. It is also recommended for measurements which could be affected by the following limitations.
 - a.) Solid contaminants settling on the sensitive electrode can produce a zero offset (apparent long term drift) and increased noise in the output. An example of such contamination would be where there are quantities of electrostatic toner in the atmosphere.
 - b.) Changes in the constituent gases in the atmosphere can cause zero offset error as the gases are varied unless the zero reference is manually reset. This performance is apparently a result of contact potential variations caused by adsorption of the different gases by critical probe parts.
 - c.) Continuous measurements or long time constant measurements (days, weeks).

As indicated above, an apparent zero shift error will occur if the probe becomes contaminated.

A Monroe Electronics Model 1017/22G air purge kit or clean, dry shop air or dry inert gas such as nitrogen may be used for purging. Gas pressure should be only great enough to produce a slight positive flow out of the probe aperture, and in no event should it exceed 14" of water column ($\frac{1}{2}$ psi).

2. Installation of Purge Kit- Model 1017/22G

- a.) The kit should be assembled in the order: Air Pump, White air filter, Black air filter, Probe. Direction of air flow as indicated by arrows on the filters should be observed.
- b.) The plastic tubing supplied with the kit must be cut into three lengths which will be determined by the relative placement of the air pump, air filters and the probe.
- c.) The tubing will slip over the connections on the air filters more easily if the ends of the tubing are dipped in about $\frac{1}{2}$ " of clean isopropyl alcohol.
- d.) The hose clamp is furnished to secure the connection at the air pump exhaust (small tube on air pump body).

3. Operation of Air Purged Probe:

- a.) Install apparatus as outlined above. Mount probe as necessary.
- b.) Connect air pump to correct source of alternating current (AC only).
- c.) A positive air flow is now maintained at the probe.
- d.) For best results, leave the air pump in continuous operation.
- e.) When the pump is disconnected, cover the sensitive aperture with aluminum foil to seal the opening against external contamination.
- f.) The useful life of the air filters will be dependent upon individual conditions. Deterioration may be noticeably observed as gradual degradation in performance of the ISOPROBE[®] Voltmeter due to contaminants entering the probe through the purging system.
- g.) Under normal laboratory conditions, replacement of the air filters is recommended annually.
- h.) Purge kits and replacement air filter units may be obtained from Monroe Electronics, Inc.

B. PROBE MOUNTING:

The 1017HV must be mounted with the sensitive aperture

facing the surface to be measured.

The probe must be electrically isolated for up to 20,000 volts since the probe acquires the potential of the surface to be measured.

It is preferable to avoid sharp bends in the probe cable and recommended that the cable be supported by insulators where practicable.

C. PROBE-TO SURFACE-SPACING:

CAUTION: When operating at probe-to-surface spacing of less than 1/2" (1.3 cm.) -- **BEWARE OF PROBE-TO-SURFACE ARC OVER.**

Air is subject to dielectric breakdown when the probe-to-surface spacing is low and the surface voltage is high. A destructive arc-over can occur damaging the surface under test and/or the sensitive circuitry of the probe.

Probe to surface spacing should be maintained as close as physically reasonable for best performance. Typical spacing range is from .125" (3mm.) for unknown voltages to 5kV and .4" (1 cm.) for voltages up to 20 kV.

As probe to surface spacing increases instrument performance will suffer:

- 1.) Decreased Accuracy
- 2.) Decreased Speed-Of-Response
- 3.) Increased Noise
- 4.) Increased Drift

D. SYSTEM GROUNDING:

The instrument is normally grounded via the power cord and the potential is referenced to ground.

E. OUTPUT CIRCUITRY:

The output connectors are BNC connectors mounted on both front and rear panels. The output voltage is the measured voltage divided by 2000. Range is ± 10 volts.

Only one output connector should be used. See Specifications, Section 1.

Section 3

CONTROLS AND INDICATORS

FRONT PANEL-

A. MAIN POWER SWITCH:

This is an alternate action pushbutton switch with illuminating lamps built in to indicate that power is applied to the instrument. It places the unit in STANDBY and energizes all circuitry except the high voltage supplies.

Pressing the pushbutton when the lamps are lighted removes all power.

B. STANDBY SWITCH:

When illuminated, this operator/indicator indicates that the instrument is in a STANDBY condition as described above.

When the unit is in OPERATE, pressing the STANDBY button will immediately turn off the high voltage supplies without removing power from the rest of the instrument.

In the event of a severe overload the instrument will automatically drop from OPERATE into the STANDBY mode.

C. OPERATE SWITCH:

This pushbutton must be pressed **and held for approximately one second** to apply power to the high voltage supplies and cause the Model 175 to become fully operational. It is self-latched by a holding coil and is released by any of the following:

- 1.) Depressing the STANDBY button.
- 2.) Depressing the MAIN POWER button.
- 3.) Severe overloading of the high voltage supplies
- 4.) Very low power line voltage or a power interruption.

D. ZERO:

Sets the instrument zero when the probe is "looking at" a grounded surface.

E. GAIN:

System gain and response vary with probe-to-surface spacing. The gain control is provided to adjust system speed of response, static accuracy, and stability at a given probe-to-surface spacing by varying open-loop system gain. Excessive gain causes system instability and degradation in static error. Insufficient gain produces static error and slow speed-of-response.

F. PROBE CONNECTOR:

Connector for attachment of Model 1017HV probe. The probe **must** be connected for the system to function correctly.

WARNING: Model 175 is a non-contacting voltmeter. The potential of the probe connector, probe cable and the probe will attempt to follow the potential of any object within the field of view of the sensitive electrode up to 20,000 volts when the instrument is operating. In the interest of operator safety, and also to reduce high voltage stress within the instrument, it should be left in the STANDBY mode whenever it is not being used and particularly when the probe will not be "looking at" an object at a potential of less than 20,000 volts.

DO NOT TOUCH ANY PART OF THE PROBE WHILE THE SYSTEM IS IN OPERATION.

G. OUTPUT BNC CONNECTOR:

Provides a low voltage output of 1/2000th of the input with a maximum of ± 10 volts. Refer to SPECIFICATIONS, Section 1.

REAR PANEL-

A. LINE VOLTAGE SELECTOR SWITCH:

Selects correct power line voltage range, 117 or 230 volts, $\pm 10\%$, 50/60 Hz.

B. OUTPUT BNC CONNECTOR:

Identical to front panel connector. Only one should be used.

Section 4

OPERATION

CAUTION: BE SURE LINE VOLTAGE SELECTOR SWITCH ON REAR PANEL IS SET FOR CORRECT LINE VOLTAGE

A. INITIAL SET-UP:

1. With probe mounted as previously described in Section 2, connect the probe plug to the probe receptacle on the instrument front panel.
2. Press MAIN power pushbutton switch, placing Model 175 in STANDBY mode. Allow a few seconds for tuning fork in probe to achieve full amplitude.
3. Set GAIN to 1/4 to 1/3 of full rotation.
4. Press OPERATE pushbutton.
5. Set GAIN control according to the probe-to-surface spacing and desired speed-of-response.

NOTE: Decreasing the probe-to-surface spacing has the same effect as increasing the GAIN control. The GAIN control should, therefore, be re-adjusted whenever the probe-to-surface spacing is altered if optimum speed-of-response is desired.

In the event the front panel meter is the sole indicator of instrument output, the normal static error is very small and speed-of-response is non-critical. For 1 cm. (0.39 inch) spacing, set at 1/2 of clockwise rotation.

In the event a high speed recorder is to be used, it is desirable to optimize the transient response of the instrument. The procedure is as follows:

- a.) Connect a high voltage pulse generator (up to 20kV) to a plate at the same probe-to-surface spacing to be utilized (preferably the same surface if practicable) as shown in Fig. 4-1
- b.) Connect the OUTPUT to a recorder or an oscilloscope.
- c.) While pulsing, observe the instrument output and adjust for fastest speed-of-response with minimum overshoot in step response.

Once properly adjusted, the GAIN control should require no further attention unless the probe-to-surface spacing is altered.

The static follow-up error (difference in DC potential between the unknown and the probe) of a carefully zeroed and adjusted instrument is typically less than 0.1% throughout its range.

With the probe aperture viewing a zero volt (or grounded) surface, set the ZERO control for zero volts out.

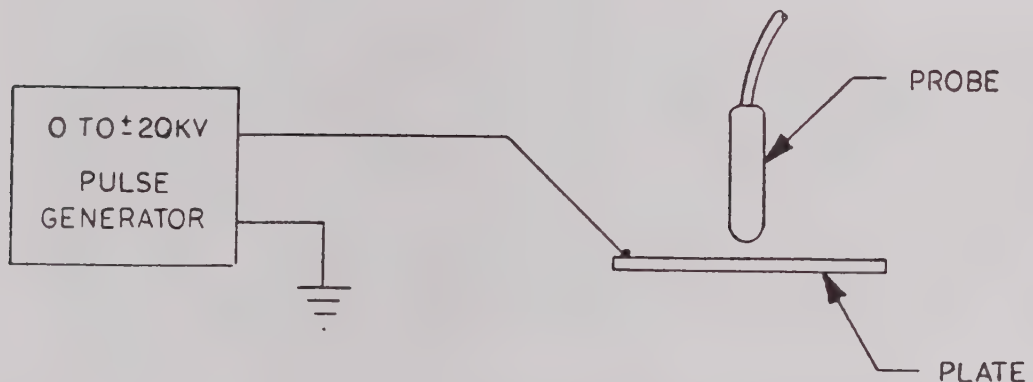


Fig 4-1

Section 5

THEORY

A. GENERAL: Principle of Operation (See Figure 5-1)

The electrostatic electrode "looks" at the surface under measurement through a small hole at the base of the probe assembly. The chopped A.C. signal induced on this electrode is proportional to the differential voltage between the surface under measurement and the probe assembly. Its phase is dictated by the D.C. polarity.

A reference signal generated by the chopper drive voltage and this mechanically modulated signal conditioned by the high input impedance preamplifier and signal amplifier are fed to a phase sensitive detector whose output D.C. amplitude and polarity are dictated by the amplitude and phase of the electrostatically induced signal relative to the reference signal. The output of the phase sensitive detector feeds a D.C. integrating amplifier. Its output polarity is inverted to drive a high voltage amplifier which in turn drives the probe to the same potential as that of the surface under measurement.

The probe is driven to a D.C. voltage typically within 0.1% of the potential of the unknown for a 1/2" probe-to-surface spacing. By simply metering the output of the H.V. amplifier, one has an accurate indication of the unknown potential.

This feedback principle and null seeking operation combine to make a remarkably stable and highly accurate instrument

B. ZERO (Null Balance):

This instrument's basic operating principle, i.e., "field-nulling" provides a high degree of immunity to errors in measurement caused by variations in probe-to-surface separation. (As long as the probe and the surface under measurement are at the same potential the electric field between them is zero, neglecting fringing, regardless of the probe-to-surface distance.)

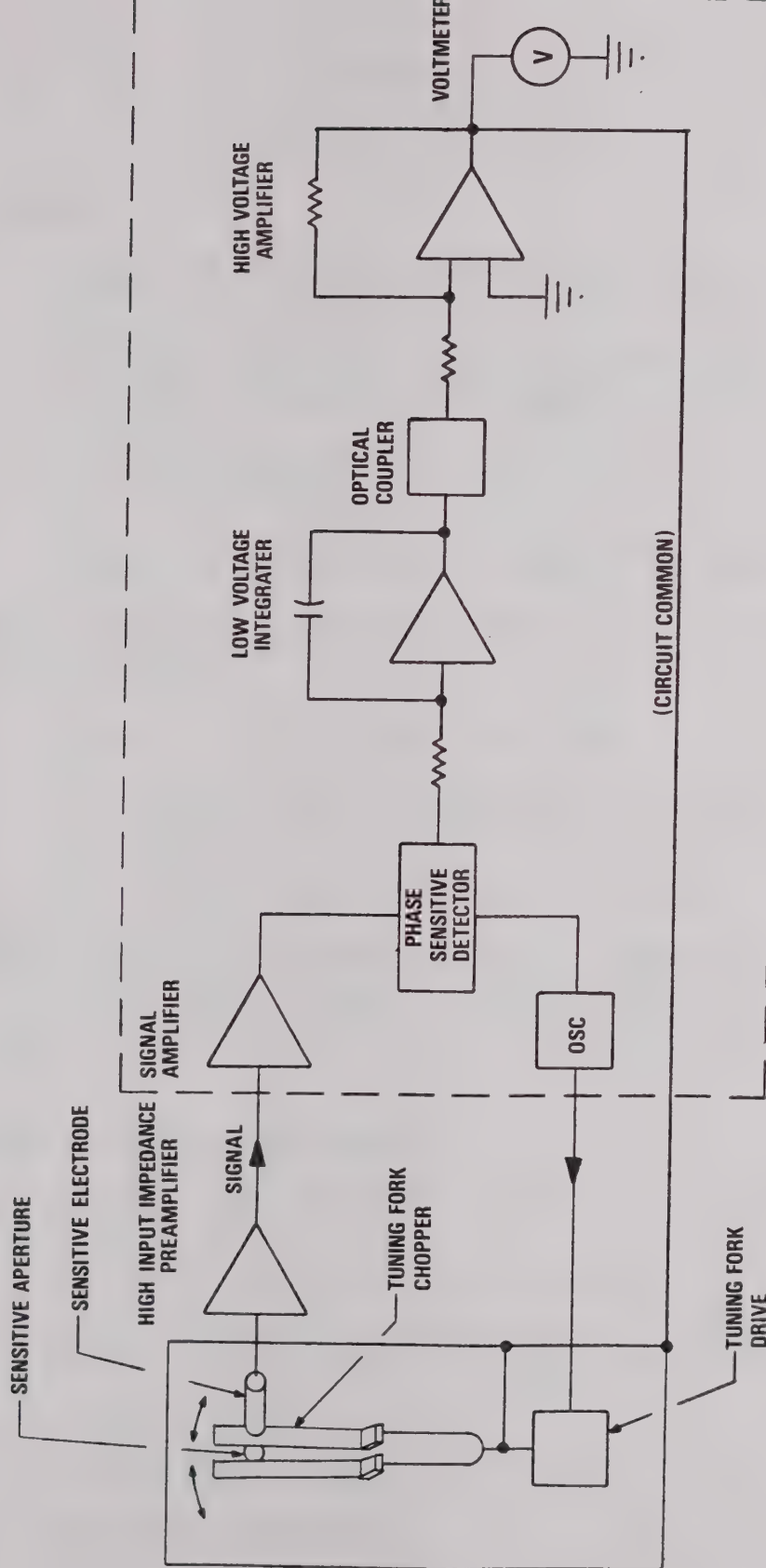
If, however, there exist voltage sources in the vicinity of the sensitive electrode which are independent of the unknown to be measured, the offsets produced will detrimentally affect the spacing independence. Such voltage sources include contact potential differences among the internal probe parts, small specks of charged dust particles, etc.

The null balance circuitry is provided to neutralize such offsets by applying a voltage directly to the sensitive electrode.

C. GAIN:

The instrument functions as a closed loop unity gain voltage follower. Its open loop gain from probe to integrator is determined by the gain of various amplifiers. The exact gain required for optimum transient response during a specific measurement is determined by the probe-to-surface spacing used. In order to accommodate measurements at various probe-to-surface spacings, a front panel gain control is provided which controls the gain of the signal amplifier.

ISOPROBE[®] ELECTROSTATIC VOLTMETER SIMPLIFIED BLOCK DIAGRAM



MAIN FRAME
FIG. 5-1

PROBE

SECTION 6

INTERNAL ADJUSTMENTS

A. GENERAL:

1. Normal operation requires the use of only the external controls as described in Sections 3 and 4.
2. Internal adjustment control settings are stable as a function of time and temperature. Frequent adjustment is neither necessary nor recommended.
3. To reduce interaction, all adjustments should be done in the order given.
4. All voltages and oscilloscope observations are with respect to chassis ground except as otherwise noted.

NOTE: FOR SOME "OPEN-LOOP" TESTS, "FLOATING COMMON" MUST BE CONNECTED TO CHASSIS GROUND AS OUTLINED IN PARAGRAPH 6.B.3.

5. Internal controls are accessed by:
 - a. Removing the instrument from its case (or rack).
 - b. Removing the perforated metal top cover.
 - c. Removing the acrylic top cover from the high voltage circuit box.
 - d. Standing the unit on its left side.

NOTE:: THE USE OF EXTENDER BOARDS -- MONROE ELECTRONICS, INC. MODEL 302G (10-PIN, DOUBLE-SIDED) AND MODEL 302D (15-PIN DOUBLE SIDED) OR EQUIVALENT -- IS RECOMMENDED TO EXPOSE TEST POINTS AND ADJUSTMENTS ON PC CARDS.

B. SETUP FOR "OPEN-LOOP" TESTS:

1. Remove covers and stand Model 175 on its left side as outlined above.
2. Pull P-102 and P-103 (see Figure 6-2).
3. Connect a jumper wire between H.V. common and chassis ground. H.V. common is TP-1 on Model 3321 PC card.
4. Connect probe.
5. Connect power cord.
6. Press MAIN POWER switch.

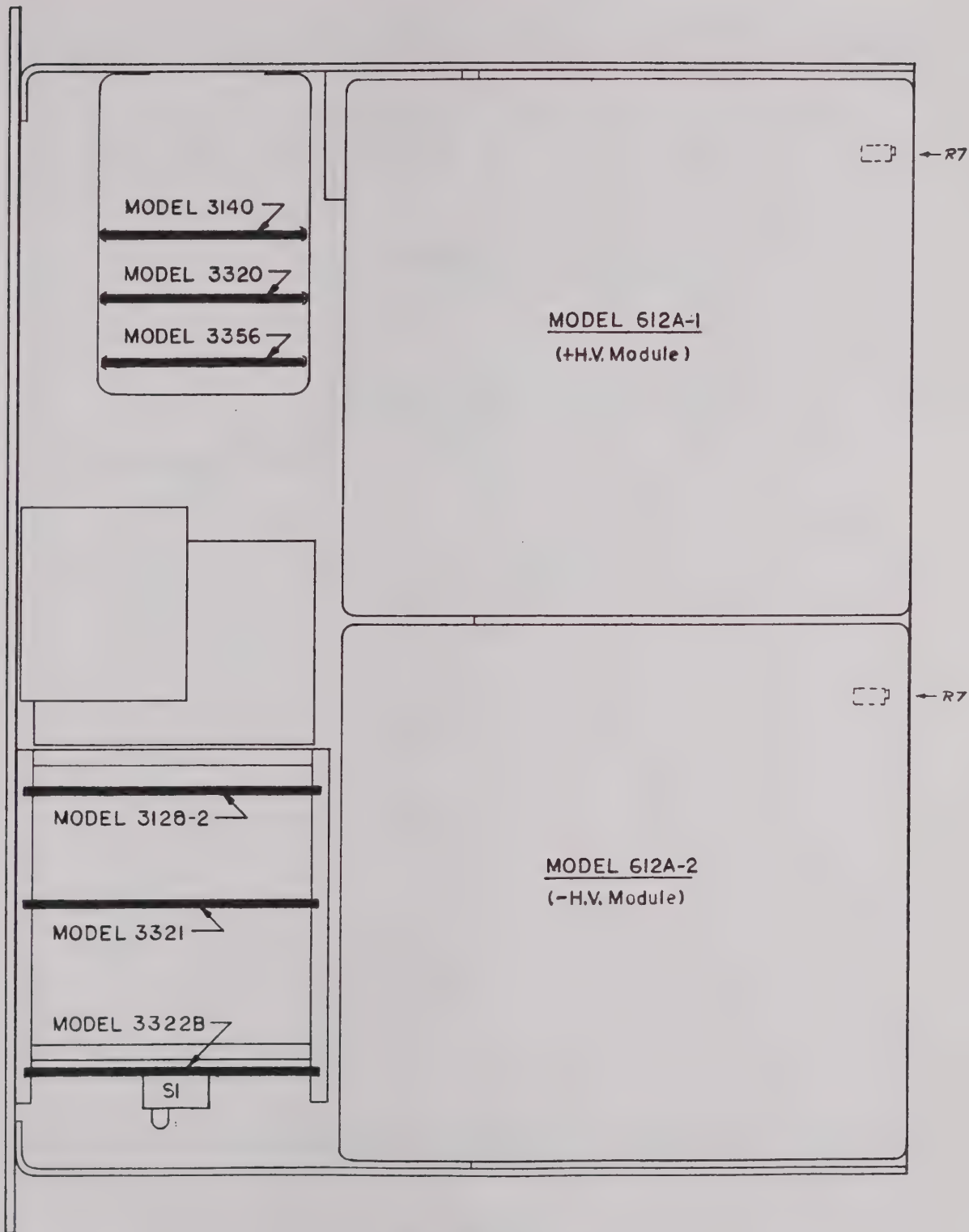


FIG. 6-1
175 TOP VIEW

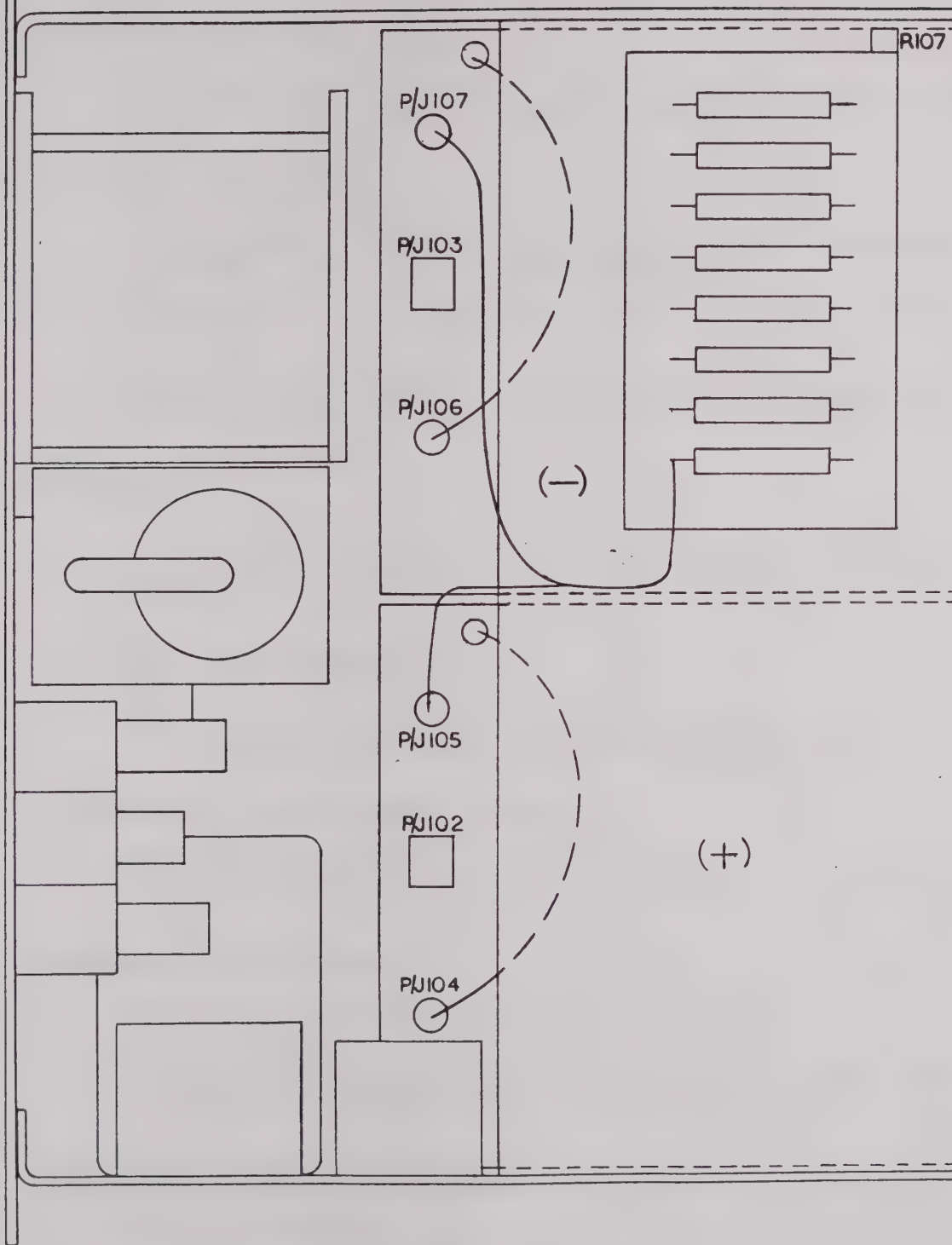


FIG 6-2
175 BOTTOM VIEW
NORMAL CONFIGURATION

C. 15 VOLT POWER SUPPLY (3140):

1. Ascertain that ± 15 volt outputs are within $\pm 5\%$ of nominal. These supplies are not adjustable.

D. +30 VOLT ADJUSTMENT:

1. Press OPERATE switch and hold approximately one second. The amber lamp in the switch should light.
2. Adjust R-12 (on 3320) for +30 volts, $\pm 2\%$ at TP-3 (on 3320).
3. Press STANDBY switch. Instrument should immediately drop into STANDBY mode.

E. OUTPUT ZERO:

1. Ground P-105 or P-107 and adjust R-107 (see Figure 6-2) for a zero reading (polarity sign indecision) on front panel DPM.

F. ± 15 VOLT POWER SUPPLIES (3321):

1. Ascertain that the ± 15 volt outputs are within $\pm 5\%$ of nominal. These supplies are not adjustable.

G. PROBE OSCILLATOR AMPLITUDE (3128-2):

1. Adjust DRIVE (R-14 on 3128-2) for a 6 volt p-p, $\pm 5\%$ sine wave at TP-2 (on 3128-2).

H. INTEGRATOR ZERO (3128-2):

1. Turn front panel GAIN to maximum CCW position.
2. Adjust INTEGRATOR ZERO (R-22 ON 3128-2) for lowest rate of drift about zero volts at TP-4 on 3321 card.

I. PHOTOCOUPLER ADJUSTMENT (3322B):

1. Disconnect probe.
2. Adjust COUPLING SET (R-1 ON 3322B) for zero volts DC at TP-8 (on 3322B).
3. Press MAIN POWER switch to shut power off.

4. Remove jumper installed in paragraph 6.B.3.
5. Replace the acrylic top on the high voltage circuit box.

J. HV AMPLIFIER SETUP:

WARNING: VOLTAGES UP TO AND EXCEEDING 20,000 VOLTS WILL BE PRESENT DURING THE FOLLOWING CHECKS AND ADJUSTMENTS.

THE PROBE MUST BE DISCONNECTED DURING THESE CHECKS AND ADJUSTMENTS

1. Connect a 200mv f.s. analog meter between TP-1 and TP-2 on 3320 card. Power supply current to the high voltage supplies is represented here by: 100mv = 1 ampere.
2. Connect a 0 to -10 volt variable voltage DC source between TP-1 (on 3322B) and chassis. Set source to zero volts.
3. Set S-1 (on 3322B) to position #3 (TEST +20KV).

NOTE: POSITION #1 IS CLOSEST TO THE INSTRUMENT FRONT PANEL.

4. Connect P-102 to J-102. Leave P-103 disconnected.
5. Disconnect P-104, P-105, and P-107. Insert P-104 in J-105. Insert P-105 in J-104. Using masking tape, temporarily fasten P-107 so that its metal tip contacts the origin of its wire.
6. Press MAIN POWER switch then press and hold OPERATE switch for approximately one second. Switch should latch and amber light stay on. Current into high voltage supply (indicated by meter installed in paragraph 6.J.1) should be well under 0.5 ampere (50mv).
7. Set R-6 (on 3322B) for -1.0 volt at TP-2 (on 3322B).
8. Set R-37 (on 3322B) for -1.0 volt at TP-5 (on 3322B).
9. Adjust R-34 (on 3322B) for a frequency of 20kHz at TP-4.
10. Set R-19A (on 3322B) for 20% duty cycle in waveform at cathode of CR-16A or CR-17A.
11. Set R-7 in the +HV module (accessible through a hole in the rear of the HV module) fully CCW.
12. Gradually apply -9 volts DC to TP-1 (on 3322B).

13. Adjust R-7 (in +HV module) for a front panel DPM indication of just under +20,000 volts. (display will "blink" at over +19,999 volts).
14. Reduce voltage applied to TP-1 (on 3322B) to zero. Adjust R-6 (on 3322B) for a reading on the front panel meter of +2000 volts ± 50 volts.
15. Repeat Steps 12 through 14 (above) until all conditions are satisfied.

NOTE: This completes setup of the POSITIVE HIGH VOLTAGE MODULE. The negative high voltage module is similarly setup as follows:

16. Shut off power by pressing MAIN POWER switch.
 17. Set S-2 (on 3322B) to position #4 (TEST -20KV).
 18. Disconnect P-102.
 19. Connect P-103 to J-103.
 20. Remove P-106 from J-106 and insert in J-107.
 21. Remove P-105 from J-104 and insert in J-106.
 22. Remove P-104 from J-105 and insert in J-104.
 23. Leave P-107 connected to the origin of its wire.
- NOTE:** At this point J-105 should be empty. The meter (paragraph 6.J.1) and the DC supply (paragraph 6.J.2) should still be connected.
24. Change polarity of DC supply (0 to +10 volts). Set output to zero volts.
 25. Press MAIN POWER and OPERATE switches as in paragraph 6.J.6.
 26. Set R-7 in -HV module (accessible through a hole in the rear of the -HV module) fully CCW.
 27. Gradually apply +9 volts DC to TP-1 (on 3322B).
 28. Check input current. Current should be approximately 0.6 ampere.
 29. Adjust R-7 (in -HV module) for a front panel DPM indication of just under -20,000 volts.
 30. Reduce voltage applied to TP-1 (on 3322B) to zero. Adjust R-37 (on 3322B) for -2000 volts ± 50 volts.

31. Repeat steps 27 through 30 (above) until all conditions are satisfied.

NOTE: This completes setup of the NEGATIVE HIGH VOLTAGE MODULE

32. Shut off power by pressing MAIN POWER switch.
33. Connect all plugs to their respective jacks, i.e., P-102 to J-102, P104 to J-104, etc. Dress leads neatly.
34. Place S-1 (on 3322B) in position #2 (TEST $\pm 2\text{KV}$). Front panel DPM should indicate within a few volts of zero.
35. Switch power on and press OPERATE button.
36. Apply -0.5 volt to TP-1 (on 3322B). DPM should indicate approximately $+1\text{kV}$.
37. Apply $+0.5$ volt to TP-1. DPM should indicate approximately -1kV .
38. Press STANDBY switch.
39. Place S-2 (on 3322B) in position #1 (OPERATE).
40. Remove test equipment.

K. SYSTEM CALIBRATION:

1. Set up probe to "look at" at a metal plate ($1/2"$ [1.3 cm] probe-to-surface spacing is recommended.)
2. Connect probe to instrument.
3. Press MAIN POWER, then press OPERATE button.
4. Zero instrument (with plate grounded) and optimize GAIN.
5. Apply an accurate source of 19,950 volts DC (either polarity) to plate.
6. Adjust R-10 (on 3356) so that DPM indicates this voltage.
7. DC output at OUTPUT BNC connector should concur.

Section 7

TROUBLESHOOTING

A. GENERAL:

Model 175 comprises a mainframe which accommodates: primary power wiring, low voltage DC power supplies, digital LED panel meter and conditioning circuitry, positive and negative high voltage generating modules, HV divider network, isolated ("floating") input circuitry, and interconnecting wiring. Modular construction is used to allow for substitution of "spares" as an aid to repair. A special high voltage probe completes the system.

Related waveforms and applicable DC voltages are indicated on schematics: 175/1, 612A-1/1, 612A-1/2, 3140/1, 3320/1, 3321/1, 3322B/1, and 3356/1.

Assembly drawings associated with the above show component location. Before attempting troubleshooting techniques, consider the following.

1. Attempt to determine mode and cause of failure. If you broke it you probably have some idea how. If someone else did, try to get as many details as possible.
2. Check control settings. Review the CONTROLS and INDICATORS section of this manual. (Section 3).
3. Check power line voltage. Be sure AC LINE SELECTOR is in the correct position.
4. Check fuse. Fuses occasionally fail due to "old age" (thermal and mechanical fatigue).
5. Look for obvious physical damage (charred parts, loose connections, broken solder joints, broken circuit boards, etc).
6. Check calibration. If it appears that the instrument is uncalibrated review the INTERNAL ADJUSTMENTS section of this manual (Section 6).
7. Always rectify the **cause** of the problem.
8. Please refer to Section 6.A for other general considerations.

B. DISABLING HIGH VOLTAGE SECTION:

The control section may be operated "open loop" for evaluation by pulling P-102 and P-103 (located on the underside of the instrument) and connecting a jumper wire from HV common (TP-1 on Model 3321 PC card) to chassis ground.

C. STAND-ALONE TESTING OF HV SECTION:

The High Voltage section may be tested separately, thus verifying proper operation of: the chassis ground referenced low voltage power supplies, high voltage generating modules, signal processor, HV divider and output amplifiers and DPM by viewing the entire section as a high voltage operational amplifier with a fixed gain of -2000 by the following:

1. (With power off) disconnect probe.
2. Connect a variable low impedance source of zero to ± 10 volts DC between TP-9 (on 3322B) and chassis.

NOTE: THIS NEGATES THE EFFECT OF THE HV ISOLATION PHOTOCOUPLER -- THE TRANSMISSION LINK BETWEEN THE "FLOATING" SECTION AND THE "GROUND REFERENCED" SECTION. THIS SUPPLY NOW PROVIDES THE INPUT SIGNAL TO THE "OPERATIONAL AMPLIFIER".

CAUTION: VOLTAGES ASSOCIATED WITH "FLOATING COMMON" MAY EXCEED 20,000 VOLTS WHEN POWER IS APPLIED. DO NOT ATTEMPT TO TROUBLESHOOT HIGH VOLTAGE CIRCUITRY WHEN IN OPERATION. KEEP COVERS IN PLACE.

3. With zero volts DC applied, press MAIN POWER. Press and hold OPERATE switch for approximately one second.

NOTE: FRONT PANEL DPM MAY INDICATE UP TO MANY TENS OF VOLTS OFF OF ZERO. THIS IS DUE TO OFFSETS IN THE SYSTEM NORMALLY COMPENSATED FOR BY THE FRONT PANEL ZERO CONTROL, NOW INOPERATIVE.

4. Performance may now be evaluated by applying up to ± 10 volts to TP-9, bearing in mind that the original zero offset remains.

NOTE: TP-9 MUST BE TIED TO A LOW IMPEDANCE SOURCE AND THE PROBE REMOVED WHILE THE INSTRUMENT IS IN THE "OPERATE" MODE FOR THIS CHECK. THE TEST IS NOT ESSENTIAL AND IS GIVEN HERE ONLY TO PROVIDE FOR EVALUATION OF GENERAL PERFORMANCE.

D. ARcing SPHERES:

The function of the pair of adjustable arcing spheres located inside each Model 612A module is to confine high voltage arcing within a short path should the control loop become open or in some other manner, the high voltage be driven excessively. They are factory set to 0.3125" (7.938 mm.) which corresponds to approximately 5 kV for "pullup" above the maximum range of the instrument.

As it is not abnormal for arcing to occur here, it is possible for metal to be deposited from one sphere to the other, creating points on one (or both) sphere(s) causing breakdown at a lower voltage. In the event this becomes troublesome, they should be polished or replaced and readjusted. Operation at high altitude can cause a similar effect in which case the spacing may require increasing.

E. ARC DAMAGE:

Although attempts have been made to make the Model 175 "goof proof", it is not indestructible. Arcing the probe to the surface-under-test should be avoided whenever possible even though protective measures have been taken in the circuitry to prevent damage.

Components most susceptible are semiconductor devices.

APPLICATION NOTE ES-23

REDUCTION OF FOLLOW-UP ERROR IN FEEDBACK ELECTROSTATIC VOLTMETERS THROUGH SHIELDING

In the general sense, a Monroe Electronics, Inc. ISOPROBE[®] Electrostatic Voltmeter may be considered to be an operational amplifier or an electronic servo system using the "slideback" technique to produce a null at its input node or sensitive electrode. Ideally, the shielding surrounding this input node or electrode is dynamically driven to the precise potential of the unknown, creating an extremely high input impedance and an extremely low input capacitance to the unknown voltage source and thus a very low input current and virtually no loading effect upon the unknown source, allowing measurement therefore, of voltages on charged surfaces, generally with very low error.

If, however, this "driven shield" is interrupted or becomes ineffective against external influences such as nearby charged objects, the input is nulled against an erroneous field, producing a false measurement of the surface under test.

The simplest means of assuring that the shield (probe case), is effective is to make measurements at the minimum practical probe-to-surface spacing, i.e. position the probe as close to the surface as possible without danger of breakdown of the air gap between them accounting for the maximum possible voltage difference between the surface and the face of the probe, e.g. consider the maximum output voltage of the electrostatic voltmeter if, for any reason, the feedback loop should be opened. Best resolution of small charged areas will be realized at this close spacing and since the probe face is large relative to the field of view of the sensitive electrode (roughly a cone), influence from foreign charges should be minimized.

However, in the event that a large probe-to-surface spacing must be maintained, additional shielding may be necessary to prevent "follow-up error" in the order of several percent. This shielding should follow the contour of the surface under measurement and must be driven by the output (feedback) of the electrostatic voltmeter. This is the probe case. See Figure 1. The face of the probe must lie in the same plane as the active surface of the shield thereby necessitating a hole in the shield.

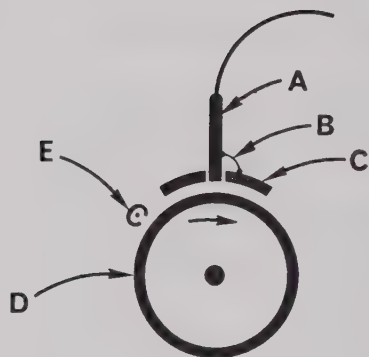


FIG. 1

TYPICAL APPLICATIONS

- A. Probe
- B. Electrical Connection
- C. Metallic Shield
- D. Rotating Coated Drum With Run-out
- E. Representative Extraneous Charge Source (Corotron, Ground Plane, etc.)

APPLICATION NOTE ES-24

HINTS FOR TROUBLESHOOTING THE MONROE ELECTRONICS, INC. MODEL 175 BY CARD REPLACEMENT

1. As received, adjustments are close since the cards are pretested, but cannot be expected to be absolutely correct for a specific instrument.
2. Cards should be changed only with power off.
3. With cover removed from the plexiglass high voltage cage (near the front of the instrument), an attempt should be made to limit output to the order of $\pm 5\text{kV}$.
4. If high voltage cannot be controlled, it is wise to disable the high voltage section of the instrument until the probable trouble is found. See Section 7-B of instruction manual.
5. Failure of the instrument due to arcing is generally manifested in the destruction of one or more semiconductors - usually an operational amplifier. The mode of failure is normally (though not always) a short which imposes an overload on the ± 15 volt power supplies. The offending component will become very hot.

MATERIAL LIST

MAIN FRAME

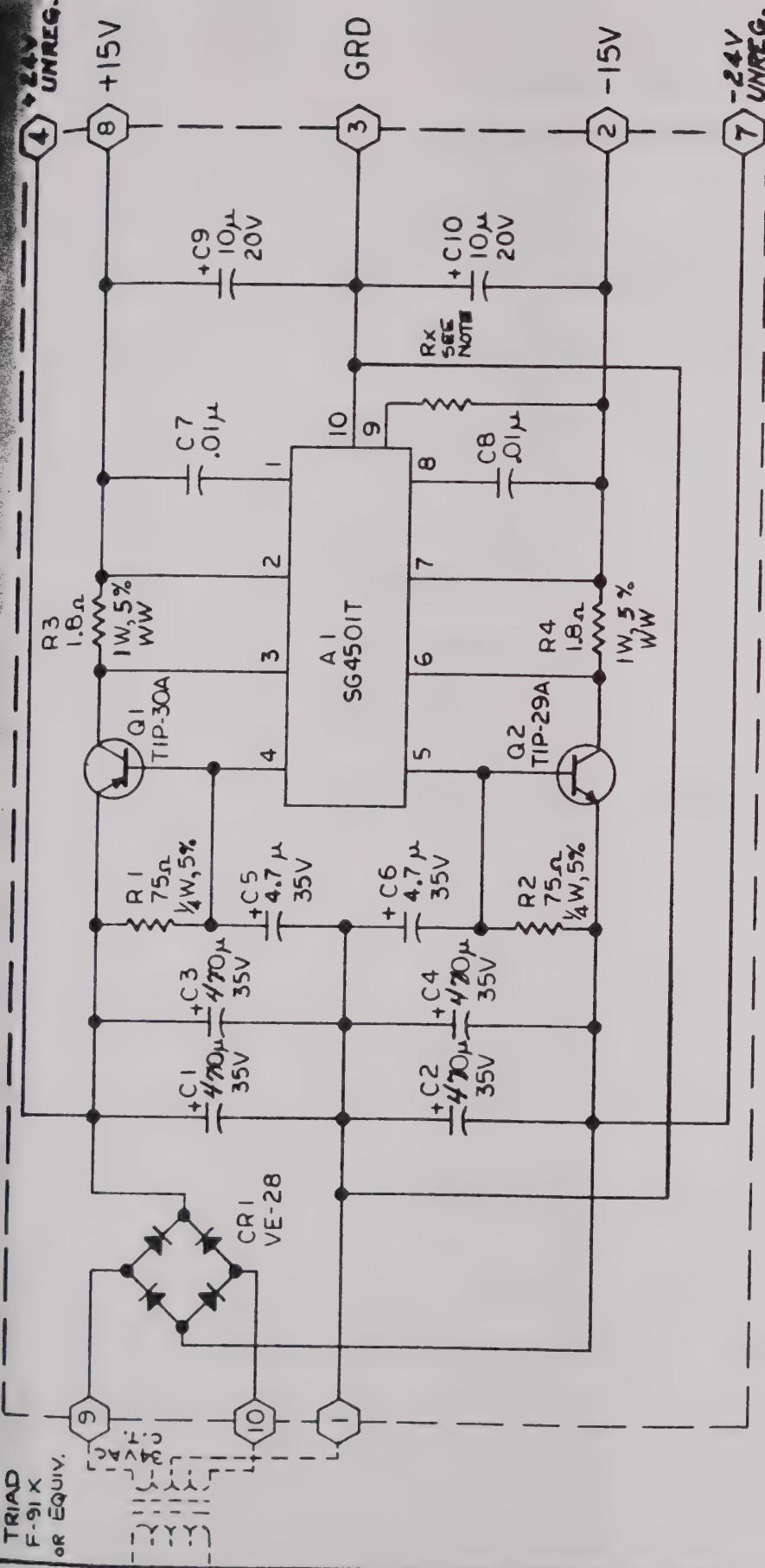
REF.	DESCRIPTION	VENDOR NO.
R120	Res. 0.51 ohm, 2W 5%	ALLEN BRADLEY-HB
R119	Res. 100 ohm, 2W, 10%	ALLEN BRADLEY-HB
R122	Res. 10K, 1/4W, 10%	ALLEN BRADLEY-CB
R121	Res. 0.1 ohm, 3%	OHMITE 884-5
C111-113	CAP. 5800 uF, 40V	SPRAGUE 36DX582GO 40AB2A
C109	CAP. .05 uF, 25V (Cerm)	CENTRALAB UK25-503
CR102 & 103	Diode	G.E.GEA15A
CR104 & 105	Diode	G.E. A114A
Q102	Transistor	TEXAS INS. 2N3055
Q101	Transistor	TEXAS INS. TIP-30A
T102	Transformer	SIGNAL DP241-7-16
T101	Transformer	SIGNAL DP241-6-36
F101	Fuse, 2A	LITTLEFUSE 3AG
S102	D.P.D.T. Switch	STACKPOLE SS-50
	Connector 9 pin	MOLEX 03-06-1092
	Pin	MOLEX 02-06-1103
	Clamp	MULLER 96011
	H.V. Connector	ALDEN 8101M-90-4
3140/22	P.C. Board Assembly	MONROE ELECTRONICS
3320/22	P.C. Board Assembly	MONROE ELECTRONICS
3356/22	P.C. Board Assembly	MONROE ELECTRONICS
175/22E	Divider Resistor Assy.	MONROE ELECTRONICS
612A-1/22	H.V. Module Assy. Plus	MONROE ELECTRONICS
612A-2/22	H.V. Module Assy. Minus	MONROE ELECTRONICS
	Bulb Boot, GN	MASTER SPEC. 12-G
	Bulb Boot, Amber	MASTER SPEC. 12-A
	Bulb Boot, Wh.	MASTER SPEC. 12-W
	Switch-lite Unit	MASTER SPEC. 12-4
	Switch-lite with Holding coil, 28 V.D.C.	MASTER SPEC. 12-20
	Vert. Mtg. Barrier	MASTER SPEC. 23-S3
	Alt. Action 4PDT Switch	MASTER SPEC. 12-E
	Mom. Action DPDT Switch	MASTER SPEC. 12-C

	Mom. Action DPDT Switch	MASTER SPEC. 12-D
I101-106	Lamp, 28 V.D.C.	GENERAL ELECTRIC 327
CR101	Diode	MOTOROLA IN5347A
	BNC Connector	AMPHENOL 31-10
	DPM With Connectors	IMC 61012
R101	Potentiometer, 10K	CLAROSTAT A43-10K
R102	Potentiometer, 25K, 10T	ME 91017
R103 & 106	Res. 10K, 1%	RNGOD 1002F
R104 & 105	Res. 4.99K, 1%	RNGOD 4991F
	Shaft	CLAROSTAT RN-3
	Bushing Nut	CLAROSTAT 59-186
	P.C. Board Connector	CINCH 50-30A-30
	Connector	AMP 206043-1
	Pin	AMP 66594-2
	Photocoupler Assy.	ME 175/22H
	Isolation Transformer	ME 175/22F
	P.C. Board Assy.	ME 3128-2/22
	P.C. Board Assy.	ME 3321/22
	P.C. Board Assy.	ME3322B/22
R110	Res. 198K, 0.1%	TELAB SA3
R111-118	Res. 50M, 1%	PME 91038
R107	Pot. 25K	BECKMAN 78PR25K
R108	Res. 20K, %	MF 1/4 - 1/2
R109	Res. 15 ohm, 1%	MF 1/4 - 1/2
R122	Res. 150 ohm, 1/4 w, 5%	ALLEN BRADLEY-CB
C101-108	Cap. 100p, 3kV	CRL DD30-101
C114	Cap. 47 uF, 50V	SPRAGUE
		5130476M050BB4
C115	Cap. .0015 uF, 200V	SPRAGUE 192P15292
C116	Cap. 56 uF. 25V	SPRAGUE
		196D566X9025TE4

MATERIAL LIST
MODEL 612A H.V. MODULE

REF. NO.	DESCRIPTION	MFG.
Q101	Transistor	MOTOROLA IRF640
J101	Connector Shell	MOLEX 03-06-2091
	Pin	MOLEX 02-06-2103
	H.V. Cable (Female)	ALDEN 8101FP
	P.C. Board Assy.	ME 3489-1 (+) or ME 3489-2 (-)
	Arcing Sphere, $\frac{1}{2}$ " dia. Photocoupler Assy.	UNIV. VOLTR. TS-20 ME 175/22G

TRIAD
F-91 X
OR EQUIV.



NOTE:

1. FOR 3140-14.2 ADD R_x (≈100K) TO SOLDER SIDE AS REQUIRED TO CAL. VOUT TO 14.1 TO 14.3V.

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KEY PIN BETWEEN 9 & 10

3140/1

B ₁	C1-4 WAS 500u	REV	THY 9-18-88
B	ADDED NOTE 1	BWC	9-2-2
A	ADDED UNREG. OUTPUTS	JPA	3-14-

REVISIONS			
LOC	LET	SCALE	DATE
		~	21 JUNE 74
		DRAWN	BWC
		CM HD	
		APP'D	9/16/74
NEXT ASSEMBLY	NO REQ.		

TOLERANCE UNLESS OTHERWISE SPECIFIED
DECIMAL - .003 FRACTIONAL - 1/16

MATERIAL

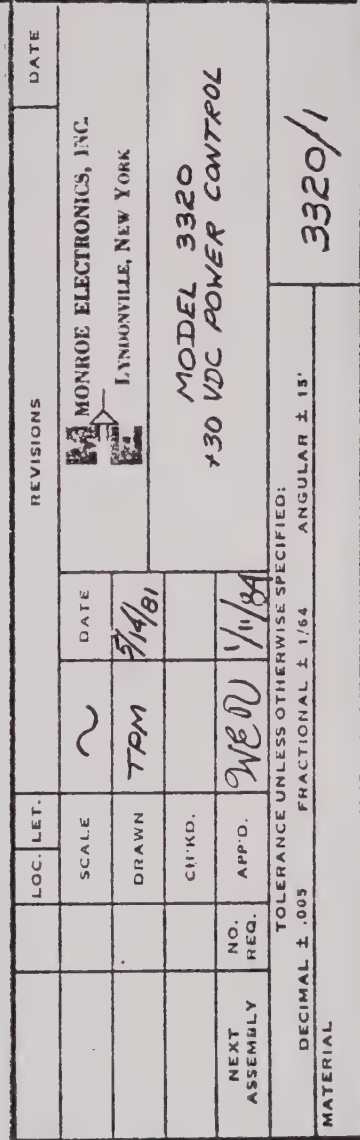
MONROE ELECTRONICS, INC.
LYNNVILLE, NEW YORK

MODEL 3140
±15V DC 300mA
POWER SUPPLY

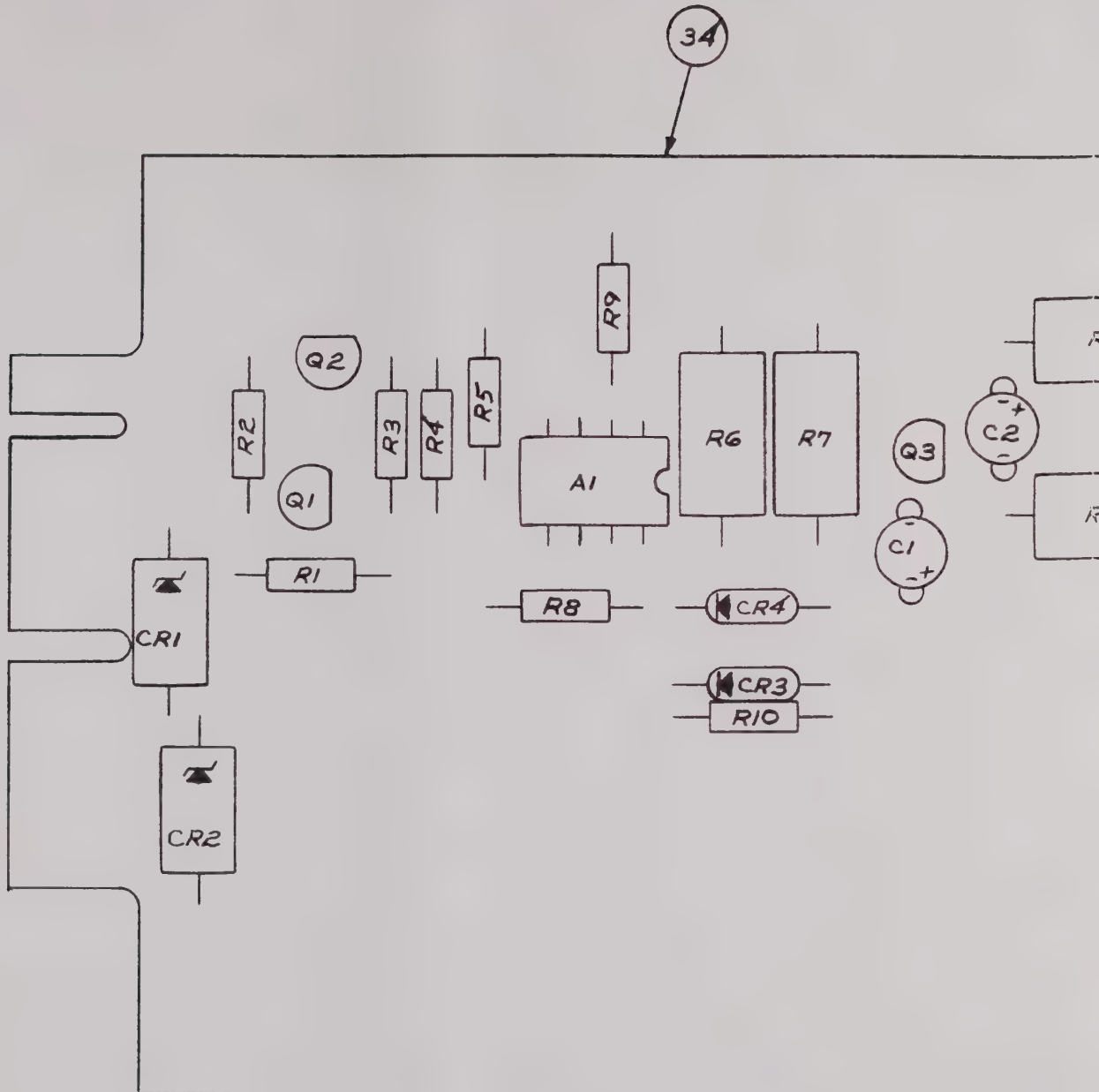
3140/1

MATERIAL LIST
MODEL 3140 POWER SUPPLY

REF.	DESCRIPTION	MFG.
R1, 2 R3, 4	Res. 75 ohm., 1/4W, 5% Res. 1.8 ohm., 5%, WW	ALLEN BRADLEY-CB IRC BW20
C1, 2, 3, 4 C5, 6	Cap. 500 uF, 35V Cap. 4.7 uF, 35V	ARCO RME-O-H-500 SPRAGUE 150D475X 0035B2
C75, 8 C9, 10	Cap. .01 (Ceramic) Cap. 10 uF, 20V	SPRAGUE TG-S10 SPRAGUE 150D106X 9020B2
CR1	Bridge Rectifier	VARO VE-28
Q1 Q2	Transistor Transistor	TI TIP-30A TI TIP-29A
A1	Int. Circuit Heat Sink Transipad PC Board Cho-Therm Insulator (Blue)	SILICON GENERAL SG4501T IERC UP-TO66B THERM-ALLOY 7717-2IN ME 3140/71 CHOMERICS 60-11- 4969-1664



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31 TYP. 3



R12



A ₂	RELEASE TO PROD.	TPM 1-11-81
PA	ADD KEY BETWEEN SLOT	SW 1-14-83
PA	Added Key Pin 5	JG 7-16-81

3320/22
SHT. 1 of 3

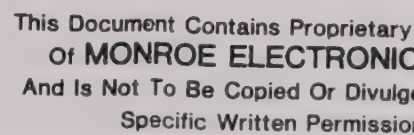
LOC		LET.		REVISIONS		DATE
SCALE		2:1		DATE		 MONROE ELECTRONICS, INC. LYNDONVILLE, NEW YORK
DRAWN		TPM		6/22/81		
CHK'D.						
NEXT ASSEMBLY		VO. REQ.		APPO.		MODEL 3320 ASSY.
				NEU		1/11/84
TOLERANCE UNLESS OTHERWISE SPECIFIED:						
DECIMAL $\pm .005$ FRACTIONAL $\pm 1/64$ ANGULAR $\pm 15^\circ$						
MATERIAL						

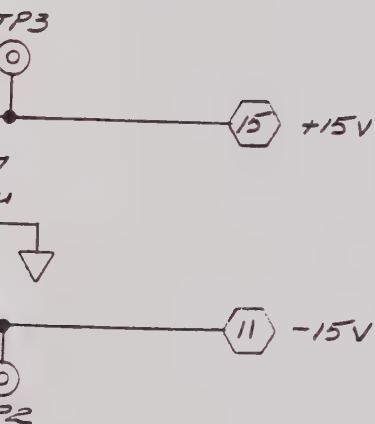
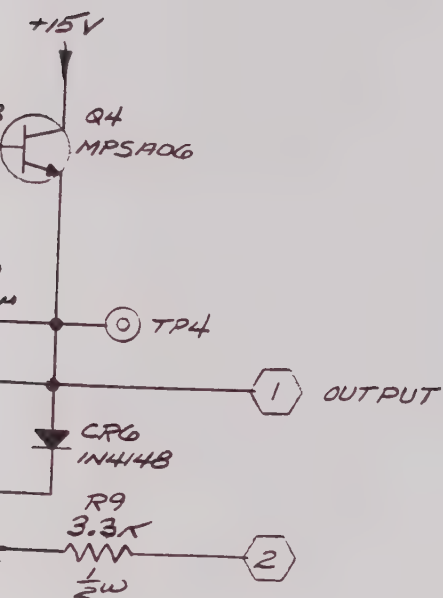
3320/22
SHT. 1 of 3

MATERIAL LIST

Model 3320 Power Supply

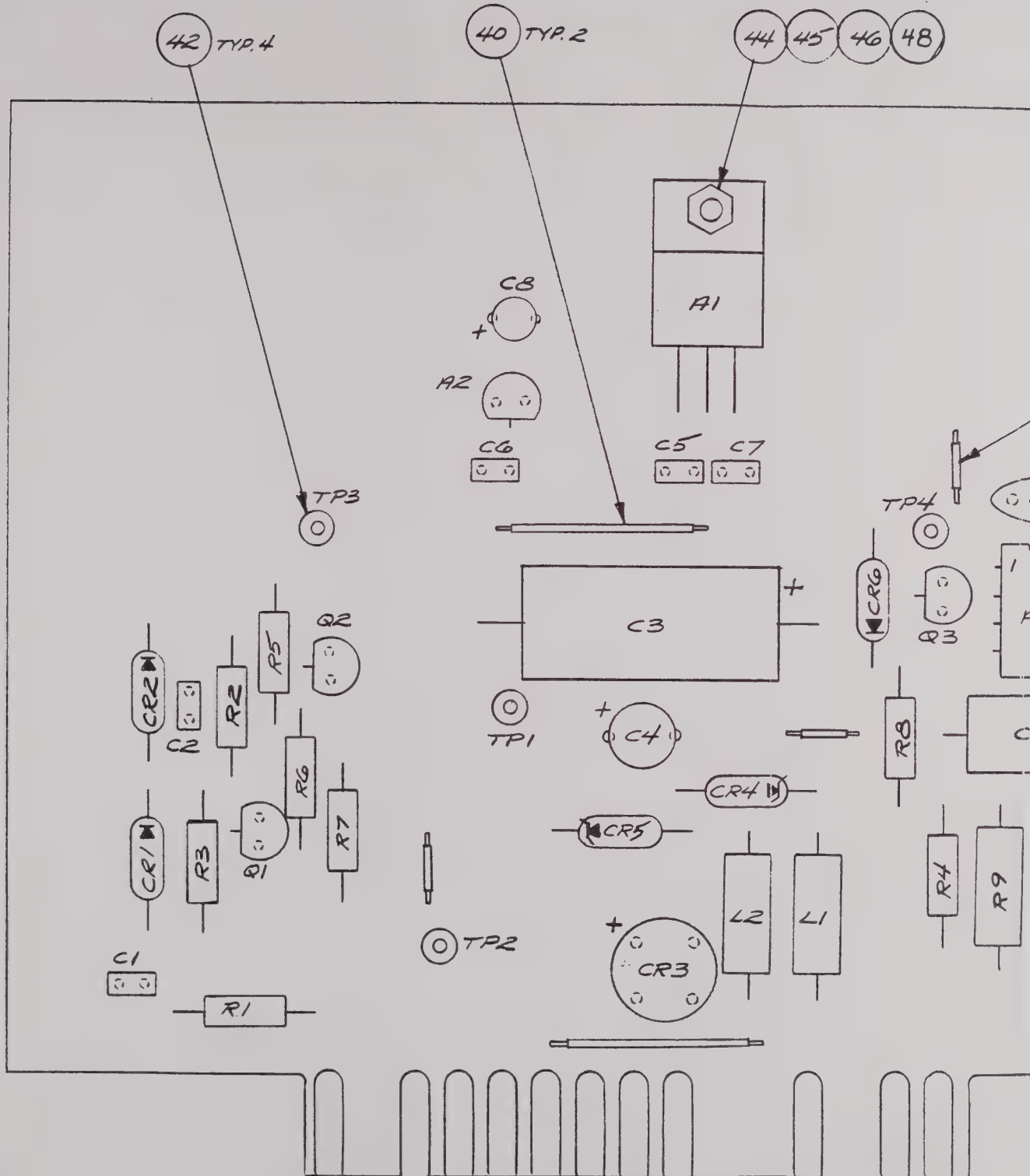
REF.	DESCRIPTION	MFG.
R1	Res. 5.1K, 1/4W, 5%	ALLEN BRADLEY-CB
R2	Res. 2K, 1/4W, 5%	ALLEN BRADLEY-CB
R3	Res. 1.3K, 1/4W 5%	ALLEN BRADLEY-CB
R4	Res. 3.6K, 1/4W, 5%	ALLEN BRADLEY-CB
R5	Res. 33K, 1/4W, 5%	ALLEN BRADLEY-CB
R6	Res. 10K, 1%	MF 1/4-1/2
R7	Res. 4.99K, 1%	MF 1/4-1/2
R8	Res. 100 ohm., 1/4W, 5%	ALLEN BRADLEY-CB
R9	Res. 2.4K, 1/4W, 5%	ALLEN BRADLEY-CB
R10	Res. 330K, 1/4W, 5%	ALLEN BRADLEY-CB
R11	Res. 2.67K, 1%	MF 1/4-1/2
R12	Pot. 100 ohm	BECKMAN 72XR100
R13	Res. 499 ohm., 1%	MF 1/4-1/2
C1 & 2	Cap. 10 uF, 35V	SPRAGUE 196D106X9 035PE4
CR1 & 2	Transorb	GSI MPTE-18
CR3 & 4	Diode	SYLVANIA IN4148
Q1	Transistor	Motorola MPS-A56
Q2	Transistor	MOTOROLA MPS-A06
Q3	FET	SILICONIX E174
A1	IC	FAIRCHILD 741-TC
	PC Board	ME 3320/71

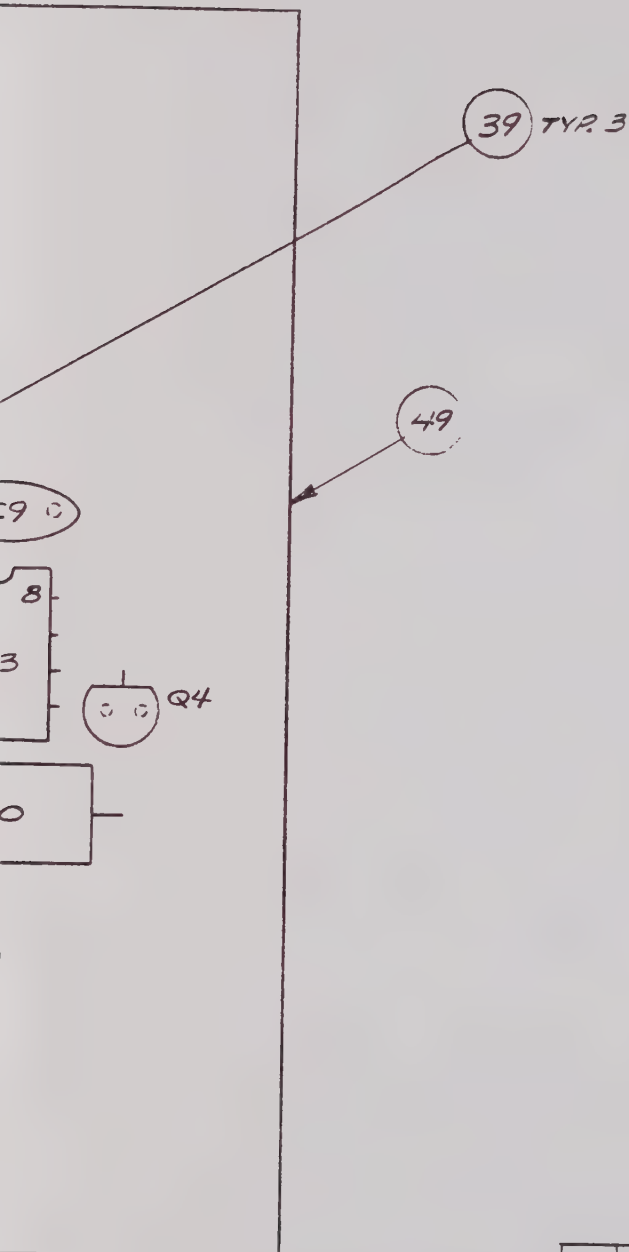




formation
INC.
Without

		R9 WAS 1.5K		JN 4-28-88 Tpm 4-28-88		3321A/1	
LOC.		LET.		REVISIONS			DATE
SCALE		~		DATE		 MONROE ELECTRONICS, INC. LYNDONVILLE, NEW YORK	
DRAWN		JN		6/26/86			
CH'KD.							
NEXT ASSEMBLY	NO. REQ.	APP'D.	CLP 6/27/86		MODEL 3321A PWR. SUPPLY INTEGRATOR		
TOLERANCE UNLESS OTHERWISE SPECIFIED:							
TWO PLACE DECIMAL $\pm .020$				FRACTIONAL $\pm 1/64$			
THREE PLACE DECIMAL $\pm .005$				ANGULAR $\pm 15'$			
MATERIAL				3321A/1			





3321A/22
SHT. 1 of 4

A		ADDED THREADLOCK ITEM 48		DSD 5-7-92	
		LOC.	LET.	REVISIONS	
		SCALE	2:1	DATE	 MONROE ELECTRONICS, INC. LYNDONVILLE, NEW YORK
		DRAWN	JN	6/26/85	
		CH'KD.			
NEXT ASSEMBLY	NO. REQ.	APP'D.		6/27/86	MODEL 3321A ASSY DRAWING
TOLERANCE UNLESS OTHERWISE SPECIFIED: TWO PLACE DECIMAL $\pm .020$ THREE PLACE DECIMAL $\pm .005$					DRAWING NO. 3321A/22
MATERIAL					REV A
					SHT 1 of 4

MATERIAL LIST

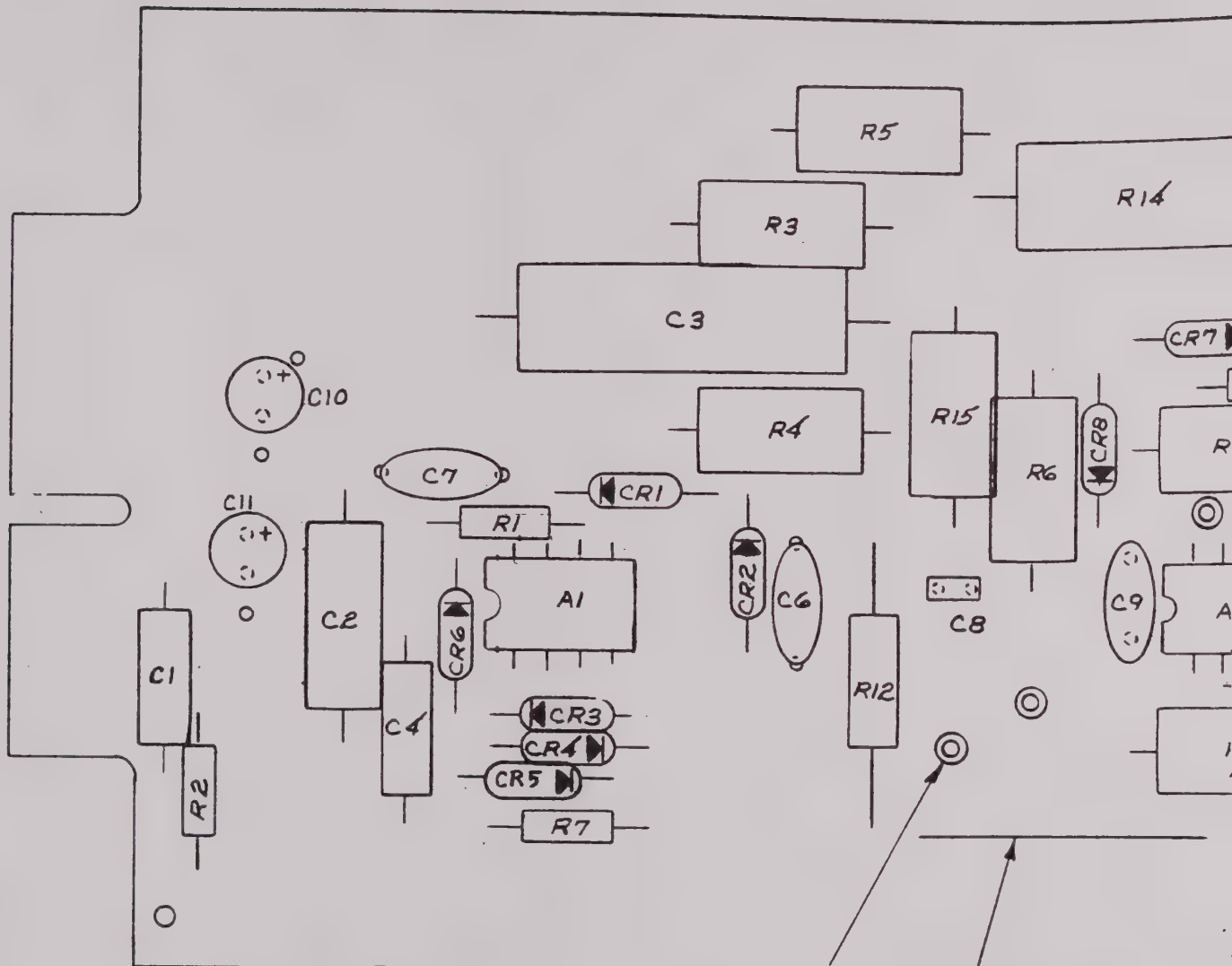
MODEL 3321A

REF.	DESCRIPTION	MFG.
R1,4	Res. 47K, 1/4W, 5%	KOA
R2	Res. 330K, 1/4W, 5%	KOA
R3	Res. 910K, 1/4W, 5%	KOA
R5	Res. 1K, 1/4W, 5%	KOA
R6	Res. 10K, 1/4W, 5%	KOA
R7	Res. 100K, 1/4W 5%	KOA
R8	Res. 470K, 1/4W, 5%	KOA
R9	Res. 3.3K, 1/2W, 5%	ALLEN BRADLEY-EB
C1	Cap. .01 μ F, 50V	CRL CY15C103M
C2	Cap. .47 μ F, 50V	CRL CY30C474M
C3	Cap. 50 μ F, 50V	SPRAGUE TE-1307
C4	Cap 10 uF, 35V	SPRAGUE 196D106X9 035PE4
C5,6,7	Cap. .01 μ F, 50V	USCC CY20C104P
C8	Cap. 1 μ f. 35V	SPRAGUE 196D105X9 035HA1
C9	Cap. 100pF	ELMENCO DM15-101J
C10	CaP. .022 μ F,200V	SPRAGUE 192P22392
CR1,2,6	Diode	GE IN4148
CR3	Bridge, Fast Recovery	EDAL BR376-10
CR4,5	Diode, Zener	MOTOROLA 1N4751
Q1	Transistor	MOTOROLA MPS-A13
Q2	Transistor	NATIONAL 2N4403
Q3	Transistor	NATIONAL J177
Q4	Transistor	MOTOROLA MPS-A06
A1	IC	NATIONAL LM340T-15
A2	IC	NATIONAL LM320LZ-15
A3	IC	NATIONAL LM308AN
L1, 2	Choke, 10 μ H	DELEVAN 1537-36
	PC Board	ME 3321/71

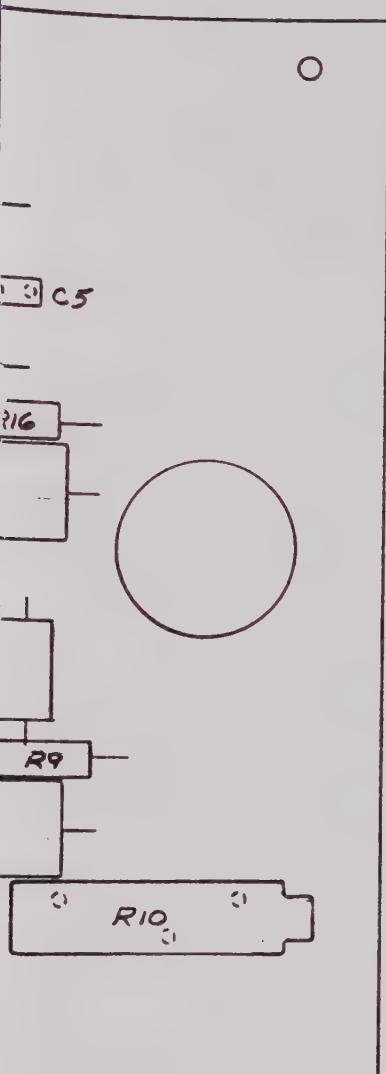
MATERIAL LIST

Model 3322B Signal Processor

REF.	DESCRIPTION	MFG.
R1	Pot 200K	BECKMAN 89PR200K
R2	Res. 10K, 1%	MF 1/4-1/2
R2A	Res. 1M, 1/4W, 5%	ALLEN BRADLEY-CB
R3,19,20,20A	Res. 10K, 1/4W, 5%	ALLEN BRADLEY-CB
R3A	Res. 1K, 1/4W, 5%	ALLEN BRADLEY-CB
R4 & 17	Res. Dip., 100K	BECKMAN 698-3-R100K
R5 & 36	Res. 39K, 1/4W, 5%	ALLEN BRADLEY-CB
R6 & 37	Pot. 1K	BECKMAN 62PR1K
R7 & 38	Res. 130K, 1/4W, 5%	ALLEN BRADLEY-CB
R8 & 39	Res. 560 ohm., 1/4W, 5%	ALLEN BRADLEY-CB
R9 & 40	Res. 43K, 1/4W, 5%	ALLEN BRADLEY-CB
R10 & 41	Res. 22K, 1/4W, 5%	ALLEN BRADLEY-CB
R11 & 42	Res. 100ohm, 1/4W, 5%	ALLEN BRADLEY-CB
R14 & 43	Res. 2K, 1/4W, 5%	ALLEN BRADLEY-CB
R15 & 46	Res. 100K, 1%	MF 1/4-1/2
R18	Res. 470K, 1/4W, 5%	ALLEN BRADLEY-CB
R19A	Pot. 20K	BOURNS 3352T-1-203
R21	Res. 332 ohm., 1%	MF 1/4-1/8
R21A	Res. 3.3K, 1/4W, 5%	ALLEN BRADLEY-CB
R22	Res. 4.7K, 1/4W, 5%	ALLEN BRADLEY-CB
R23,25,26		
28 & 29	Res. 100 ohm., 1/4W, 5%	ALLEN BRADLEY-CB
R24	Res. 10M, 1/4W, 5%	ALLEN BRADLEY-CB
R27	Res. 620K, 1/4W, 5%	ALLEN BRADLEY-CB
R30 & 31	Res. 6.8K, 1/4W, 5%	ALLEN BRADLEY-CB
R32 & 33	Res. 33K, 1/4W, 5%	ALLEN BRADLEY-CB
R34	Pot. 50K	BECKMAN 89PR50K
R35	Res. 34.0 K, 1%	MF 1/4-1/2
C1 & 14	Cap. .22 uF	CENTRALAB CW-30C
C1A	Cap. .001uF	CENTRALAB CY-15C
C3	Cap. 0.033 uF 80V	SPRAGUE 192P3339
C4,7,8,10	Cap. 0.1 uF, 25V	R8 CENTRALAB UK25-104
C5,11-13	Cap 100p	ELMenco DM15-101J
C6	Cap. 0.1 uF	USCC CY20C104M
C9	Cap. 56 uF, 25V	SPRAGUE 196D566X9025TE4
C11A & 13A	Cap. .1uF	KEMET C410C104M
C12A	Cap. 330p	ARCO DM15
C14A	Cap. 1200p	ARCO DM15
C16	Cap. .01 uF	USCC CY15C103M



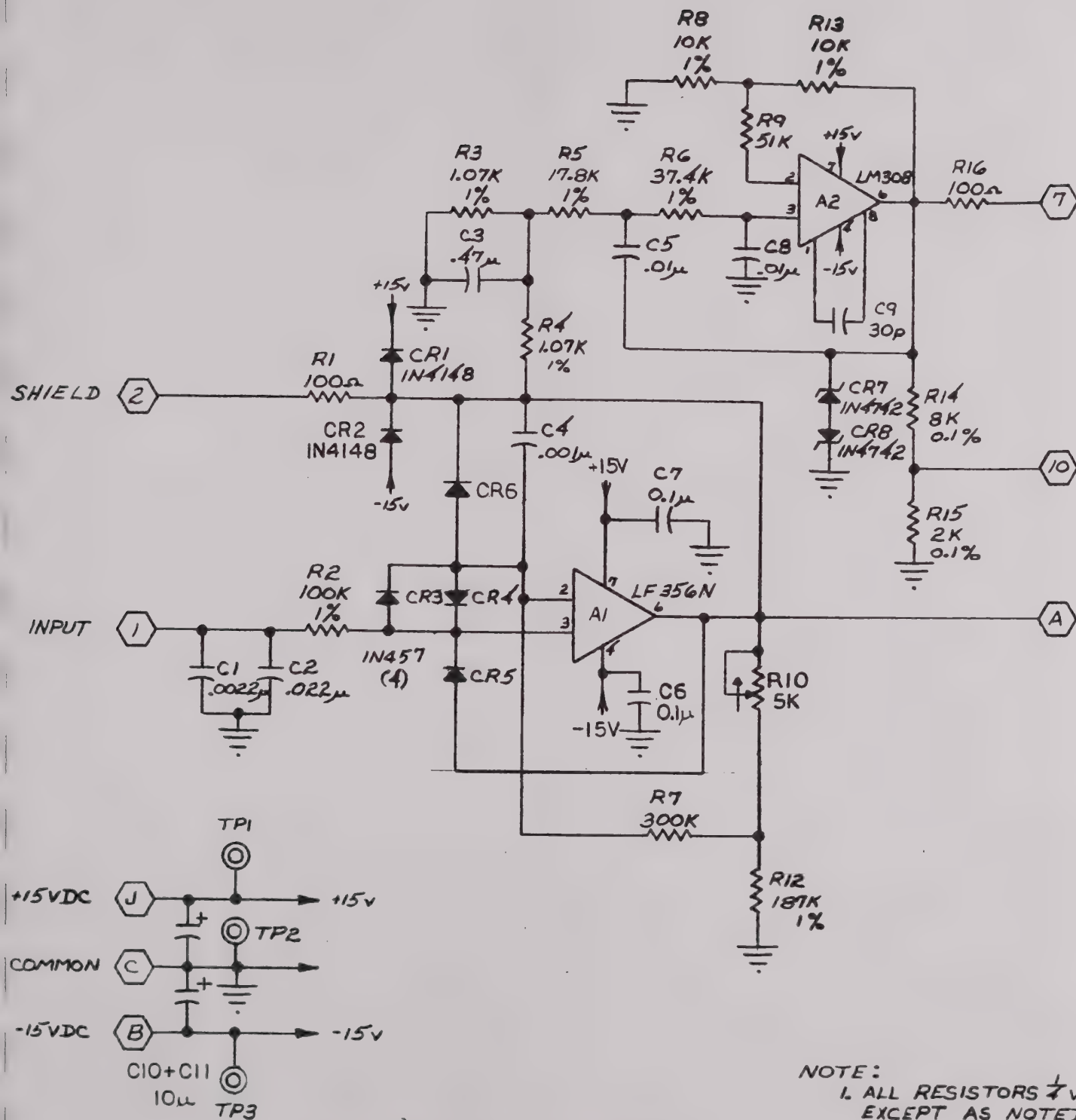
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C	ADD JUMPER, R10 +12 PART CHANGE	JM 8-27-84
B	RELEASE TO PROD.	TPM 1-16-84
PB	REV PER E.C.O 1129	SLW 1-5-82
PA	R7 WAS 100K	JG 12-11-81

3356/22
SHT. 1 of 3

		LOC.	LET.	REVISIONS		DATE
		SCALE	2:1	DATE	M MONROE ELECTRONICS, INC. E LYNDONVILLE, NEW YORK MODEL 3356 OUTPUT CARD	
		DRAWN	TPM	6/23/81		
		CHK'D.				
NEXT ASSEMBLY	NO. REQ.	APP'D.	W/80	1/17/84		
TOLERANCE UNLESS OTHERWISE SPECIFIED:						
DECIMAL $\pm .005$		FRACTIONAL $\pm 1/64$		ANGULAR $\pm 15'$		
MATERIAL						3356/22 SHT. 1 of 3



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OUTPUT

DPM

FEEDBACK

5%

D	Removed R11, R10 was 2K, R12 was 0.1% <i>W</i> JM 8/27/84
C	CR3-6 WERE IN 4148, GROUND SYMBOL <i>WAS</i> <i>NEO</i> 4-17-81
B	RELEASE TO PROD. TPM 1-16-84
PB	REV. PER E.C.O. 1129 <i>SLW</i> 1-5-82
PA	R7 WAS 100K JG 12-11-81

3356/1

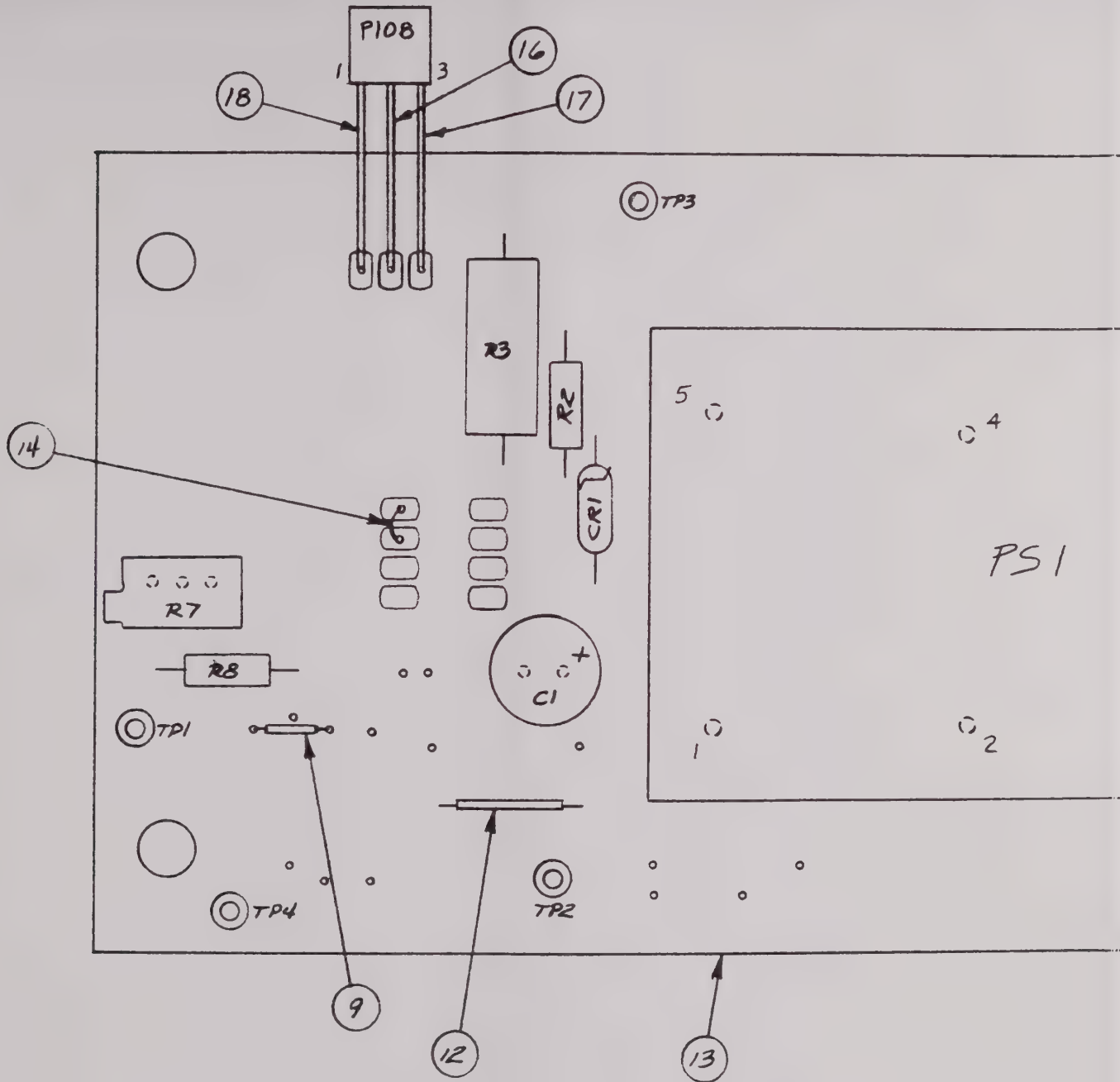
		LOC.	LET.	REVISIONS		DATE
		SCALE	<i>~</i>	DATE	M MONROE ELECTRONICS, INC. E LYNDONVILLE, NEW YORK	
		DRAWN	TPM	5/18/81		
		CHKD				
NEXT ASSEMBLY	NO. REQ.	APP'D.	<i>NEO</i> 1/17/84			
TOLERANCE UNLESS OTHERWISE SPECIFIED:						
DECIMAL $\pm .005$ FRACTIONAL $\pm 1/64$ ANGULAR $\pm 15'$						
MATERIAL						3356/1

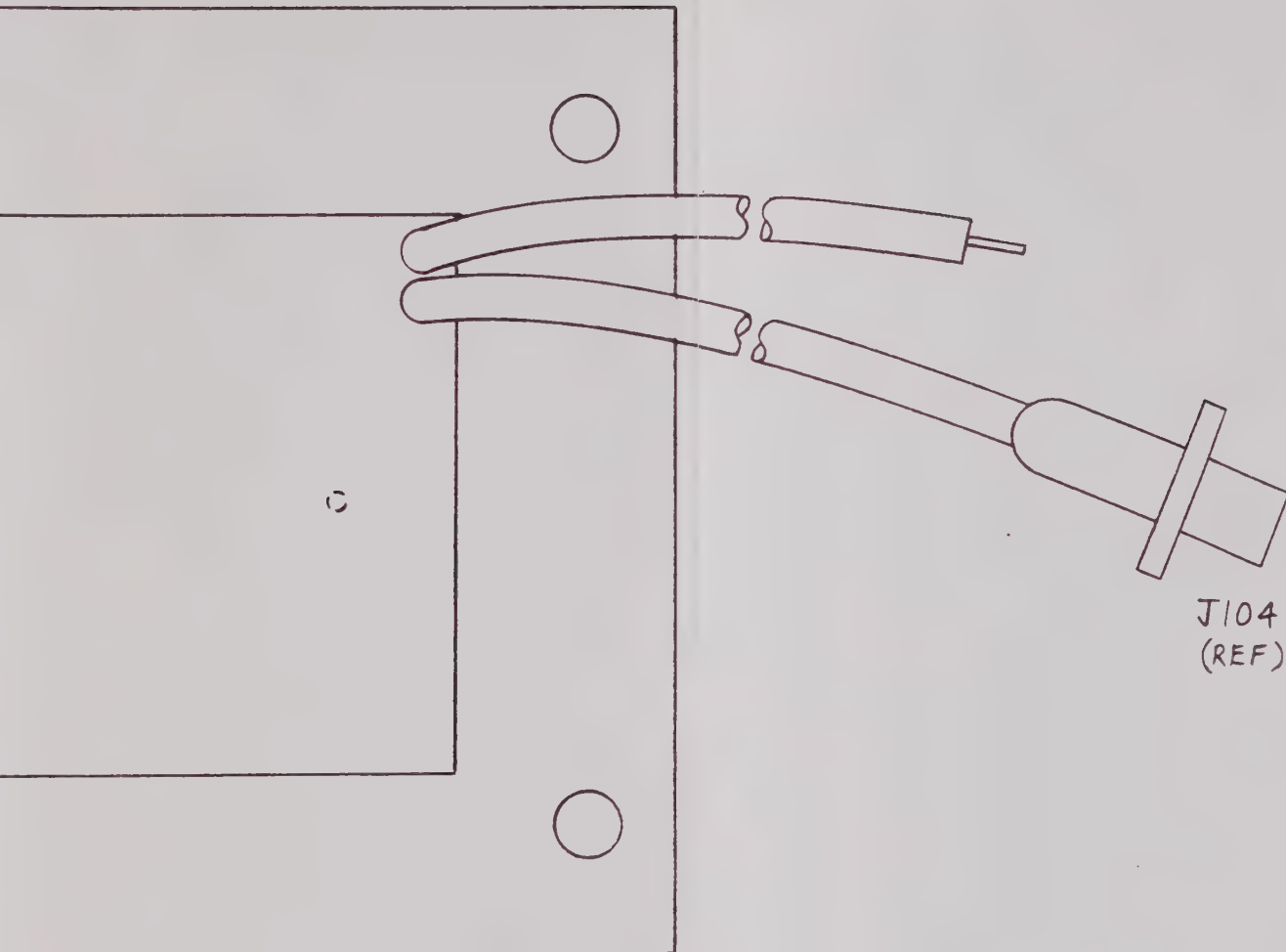
MATERIAL LIST

Model 3356 Output Card

REF.	DESCRIPTION	MFG.
R1 & 16	Res. 100 ohm, 1/4W, 5%	ALLEN BRADLEY-CB
R2	Res. 100K, 1%	CORNING RLR7C
R3 & 4	Res. 1.07K, 1%	MF 1/4-1/2
R5	Res. 17.8, 1%	MR 1/4-1/2
R6	Res. 37.4K, 1%	MF 1/4-1/2
R7	Res. 300K, 1/4W, 5%	ALLEN BRADLEY-CB
R8 & 13	Res. 10K, 1%	MF 1/4-1/2
R9	Res. 51K, 1/4W, 5%	ALLEN BRADLEY-CB
R10	Pot. 2K	BECKMAN 89PR2K
R11	Res. 1K, 0.1%	TEL LAB SA1
R12	Res. 187K, 0.1%	TEL LAB SA1
R14	Res. 8K, 0.1%	TEL LAB SA3
R15	Res. 2K, 0.1%	TEL LAB SA1
C1	Cap. .022 uF, 200V	SPRAGUE 192P22292
C2	Cap. .022 uF, 200V	SPRAGUE 192P22392
C3	Cap. 0.47 uF, 50V	CDE WMF05P47
C4	Cap. 001 uF	SPRAGUE 192P10292
C5 & 8	Cap. .01 uF, 80V	SPRAGUE 192P103 9R8
C6 & 7	Cap. 0.1 uF, 25V, (Cerm)	CENTRALAB UK25- 104
C9	Cap. 30p	ELMENCO DM15-300J
C10 & 11	Cap. 10 uF, 25V	SPRAGUE 196D106X9 025KA1
CR1-6	Diode	SYLVANIA IN4148
CR7 & 8	Diode	MOTOROLA IN4742
A1	IC	NATIONAL LF356N
A2	IC	NATIONAL LM308AN
	PC Board	ME3356/71

CR1,2,5-7,9, 10,16-20, 16A,17A	Diode	SYLVANIA IN4148
CR3 & 4	Diode Zener	MOTOROLA 1N5240
CR11	Diode Zener	UNITRODE UDZ8710
CR12 & 13	Transorb	GS1 MPTE-18
CR14 & 15	Diode Zener	MOTOROLA IN4754A
Q1 & 11	Transistor	SILICONIX J505
Q3,5,7	Transistor	MOTOROLA MPSA56
Q4,6,8	Transistor	MOTOROLA MPSA06
Q9 & 10	Transistor	SILICONIX VN10KM
Q12 & 13	Transistor	SUPERTEX TNO606N3
A1 & 2	IC	NATIONAL LM348N
A3	IC	NATIONAL LM308N
A4	IC	FAIRCHILD 741TC
A5	IC	RCA CD4047BE
A6	IC	MOTOROLA CD4011BE
A7	IC	SIGNETICS NE555N
A8	IC	CD4013BE
S1	4P4T Slide Switch	ALCO MSSA-4450G
	PC Board	ME 3322B/71





J104
(REF)

3489-1/22
SHT. 1 of 2

LOC.		LET.	REVISIONS		DATE
SCALE		2:1	DATE		 MONROE ELECTRONICS, INC. LYNDONVILLE, NEW YORK MODEL 3489-1 + HV BOARD
DRAWN		JW	10/15/90		
CHK'D.		JIT	10/18/90		
NEXT ASSEMBLY		NO. REQ.	APP'D.	10/31/90	
TOLERANCE UNLESS OTHERWISE SPECIFIED: TWO PLACE DECIMAL $\pm .020$ THREE PLACE DECIMAL $\pm .005$					FRACTIONAL $\pm 1/64$ ANGULAR ± 15
MATERIAL					

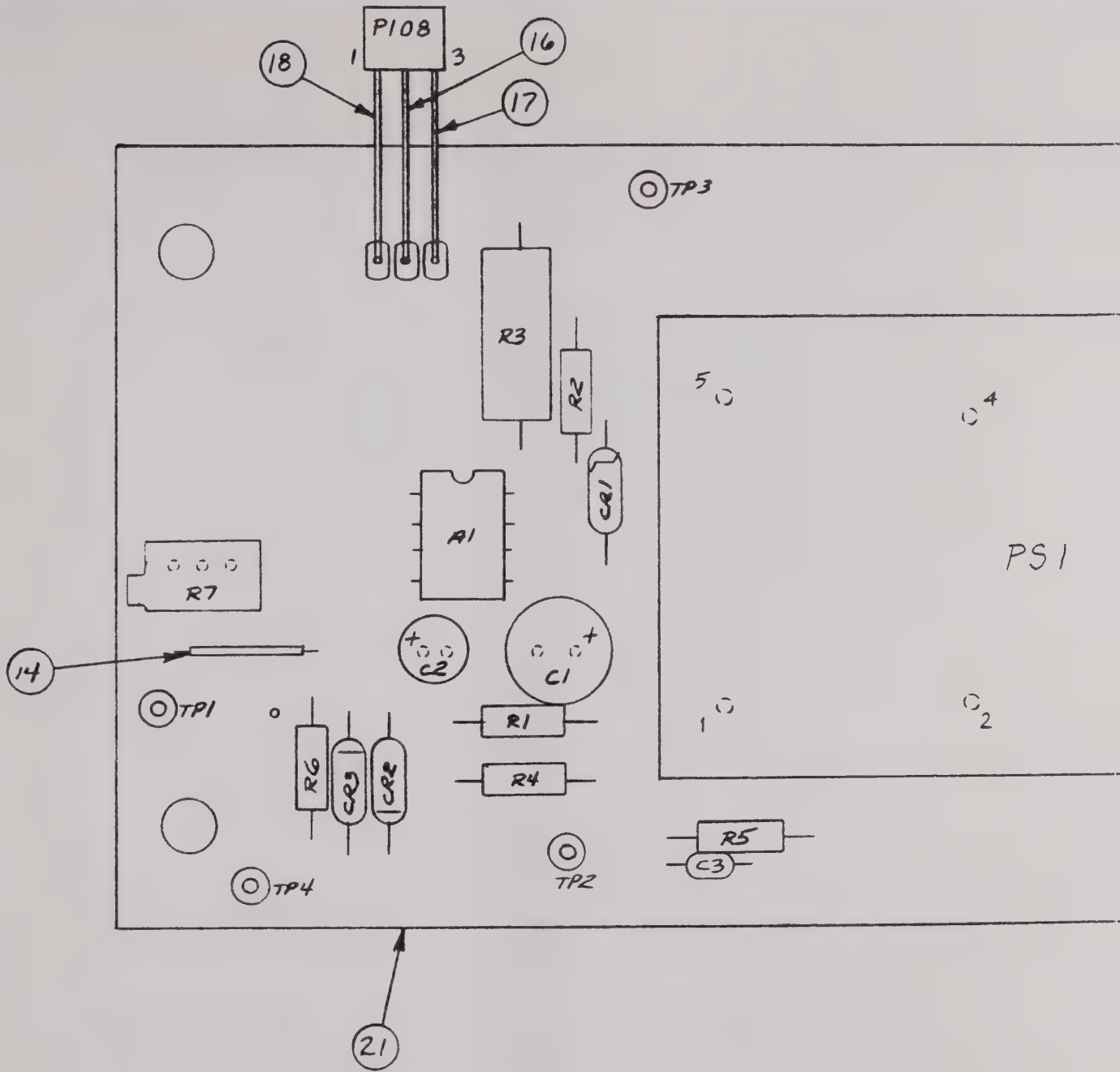
3489-1/22

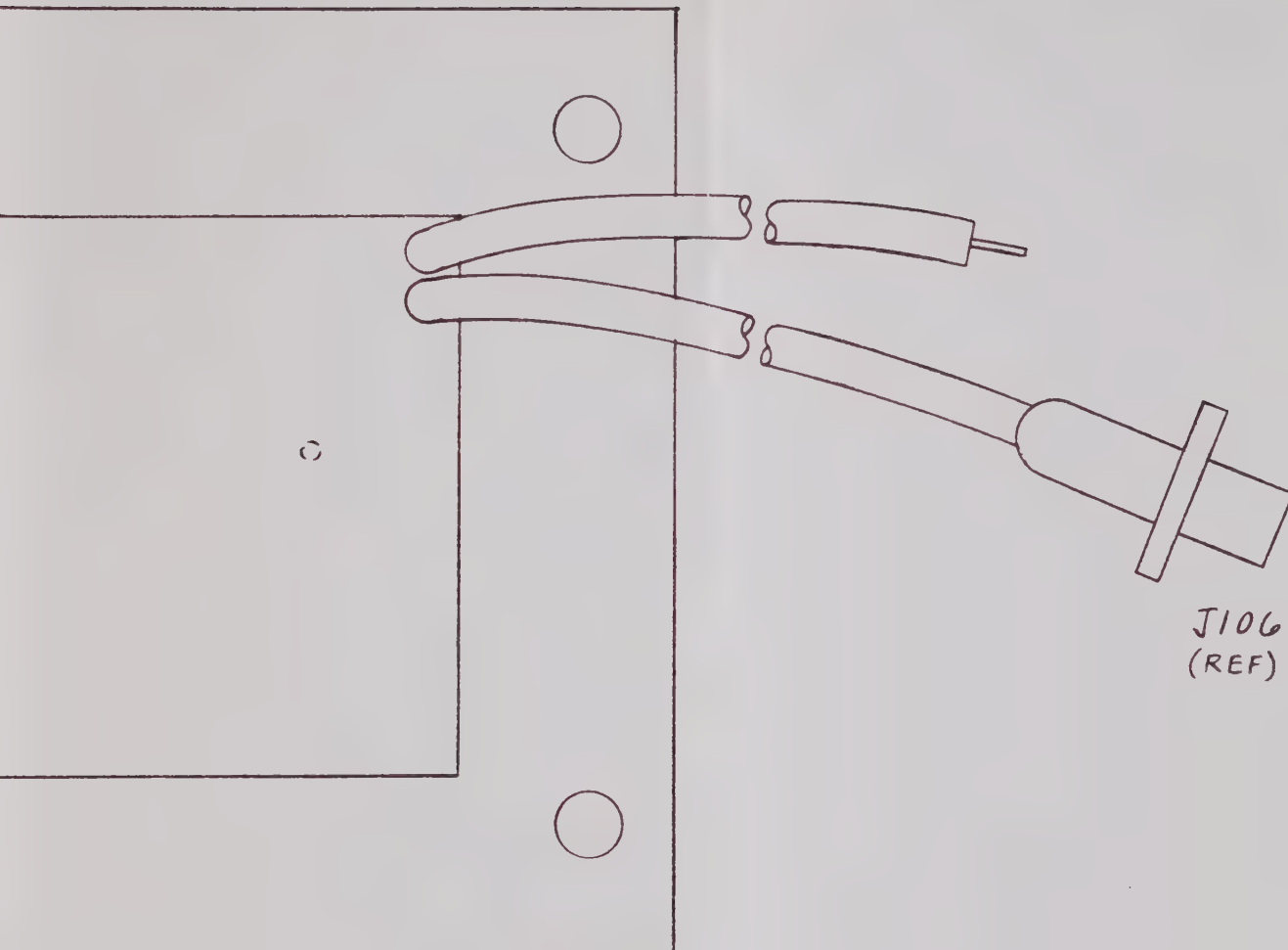
SHT. 1 of 2

MATERIAL LIST

Model 3489-1 +HV Output Card

REF.	DESCRIPTION	MFG.
R2	Res. 100Ω , $\frac{1}{4}W$, 5%	KOA CF
R3	Res. 1Ω , 2W, WW	IRC
R7	Pot. 100K	BOURNES 3299
R8	Res. 75K, 1%	MF $\frac{1}{4}-\frac{1}{2}$
C1	Cap. $33\mu F$	SPRAGUE 513D
CR1	Diode, Zener, 1N5248	MOTOROLA
	Module, +HV, 621-1	MONROE





J106
(REF)

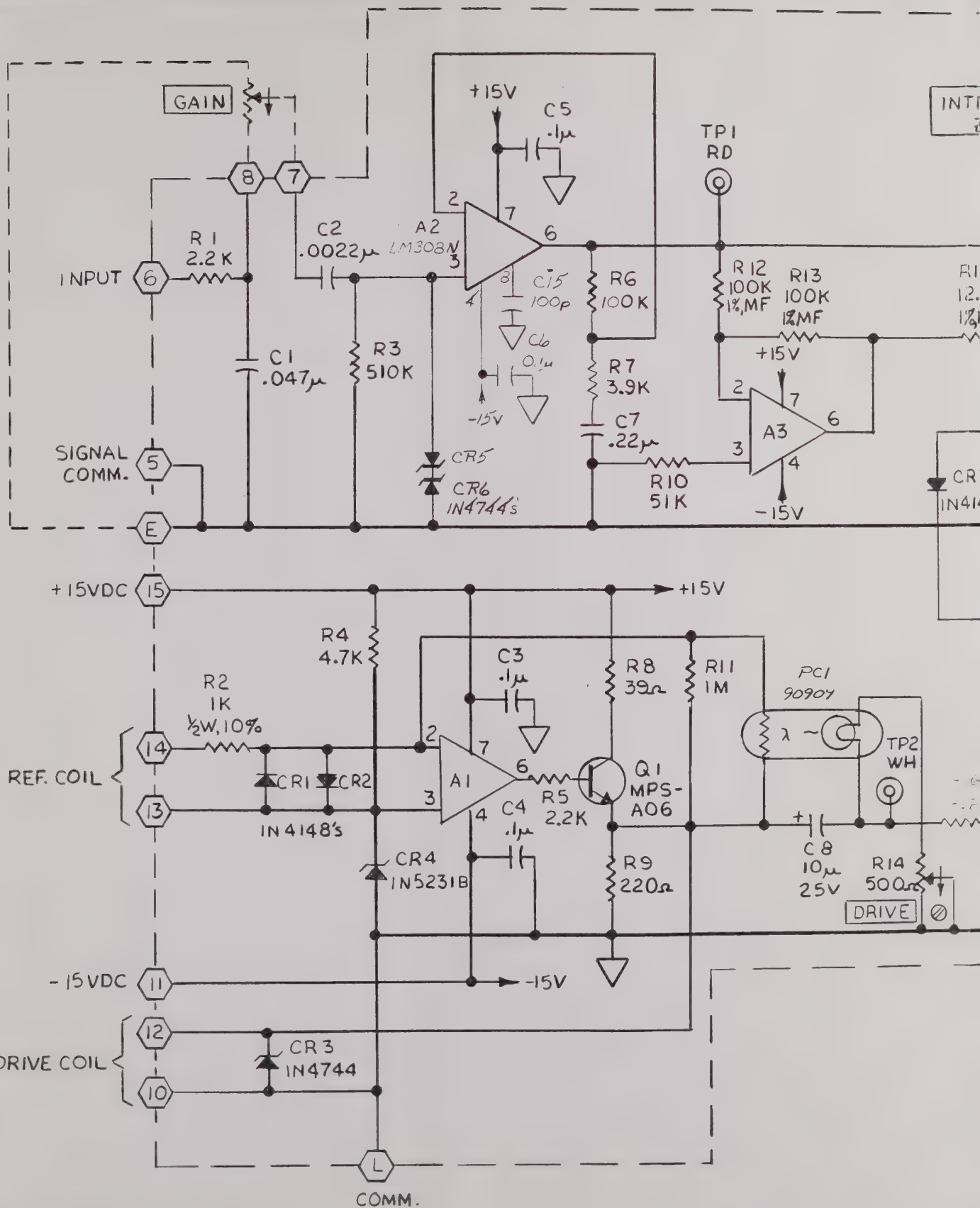
3489-2/22
SMT 1 of 2

		LOC.	LET.	REVISIONS		DATE
		SCALE	2:1	DATE	 MONROE ELECTRONICS, INC. LYNDONVILLE, NEW YORK MODEL 3489-2 -HV BOARD	
		DRAWN	JN	10/15/90		
		CHK'D.	JJT	10/29/90		
NEXT ASSEMBLY	NO. REQ.	APP'D.	RHP	11/30/90		
TOLERANCE UNLESS OTHERWISE SPECIFIED: TWO PLACE DECIMAL $\pm .020$ THREE PLACE DECIMAL $\pm .005$						FRACTIONAL $\pm 1/64$ ANGULAR ± 15
MATERIAL						3489-2/22 SMT. 1 of 2

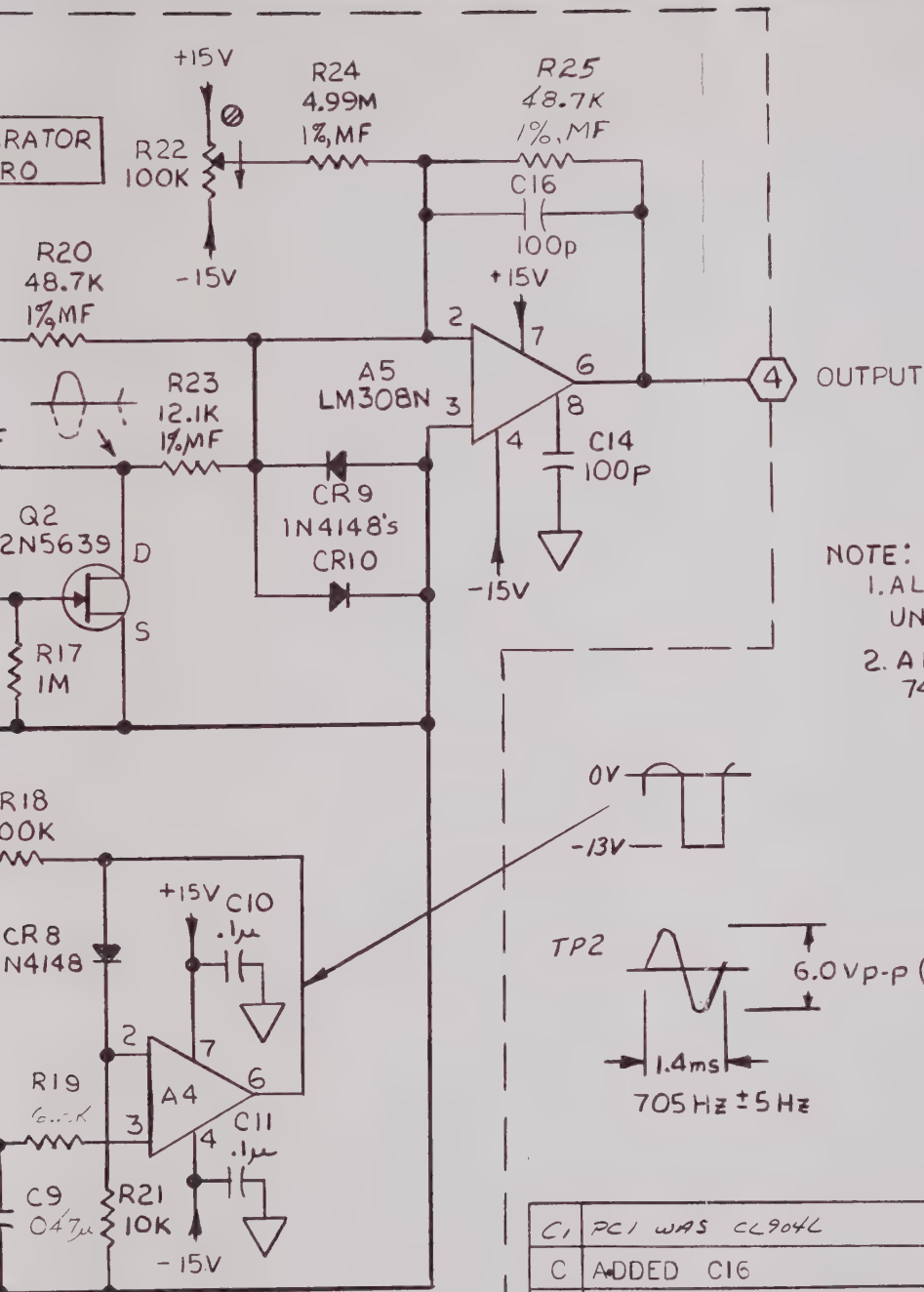
MATERIAL LIST

Model 3489-2 -HV Card

REF.	DESCRIPTION	MFG.
R1,2	Res. 100 Ω , $\frac{1}{4}$ W, 5%	KOA CF
R3	Res. 1 Ω , 2W, WW	IRC
R4,5	Res. 200K, 1%	MF $\frac{1}{4}$ - $\frac{1}{2}$
R6	Res. 150K, 1%	MF $\frac{1}{4}$ - $\frac{1}{2}$
R7	Pot. 100K	BOURNES 3299
C1	Cap. 33 μ F	SPRAGUE 513D
C2	Cap. 10 μ F	SPRAGUE 513D
C3	Cap. .01 μ F	KEMET
CR1	Diode, Zener, 1N5248	MOTOROLA
CR2,3	Diode 1N4148	FAIRCHILD
A1	IC, LM358AN	NATIONAL
	Module, -HV, 621-2	MONROE



KEY PIN BETWEEN 2#3



C1	PC1 WAS CL904L	SLY 6-9-88
C	ADDED C16	SLY 9-24-85
B	④ WAS INTEGRATOR OUTPUT	TPM 6-26-85
A	A2 WAS SG3118, ADDED C15	TPM 3-16-83

TPM 5/15/81

SLY 1/2/84

9/13/84

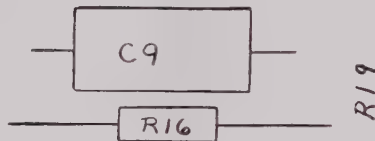
MODEL 3128-2
SMALL SIGNAL BOARD

3128-2/1

MASK

TP2

PC1



C8

+

Q1

R8

R5

R9

C3

A1

C4

CR1
CR2

R11

R2

CR3

R4

CR4

R18

C11 C10

C7

R10 CR7

R17

A3

R7

R6
1 8
A2



C2

R3

CR5

C5

A5

C6

C14

8 1



CR6

CR10
CR9

C1

R1

MASK CONNECTOR
AREA

NOTE:

1. MASK BOARD AS INDICATED USING ITEM 52 &
COAT BOARD USING ITEM 54.

0910104

MASK

51

TPI

R22

R12

R13

R15

MASK 1/8" TYP.
2 PLACES

3128-2/22
SHT 1 OF 4

46 TYP.
2 PLACES

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B2	CORRECTED REF. DESIGNATORS	TRB 8/23/89
B1	DELETED ITEMS 43, 44, 47 ADD ITEM 41 20909	6-9-88
B	ADDED C16	SLY 9-24-85
A	A2 WAS SG3118, ADDED C15	TPM 3-16-83

281

TPM 6/23/81

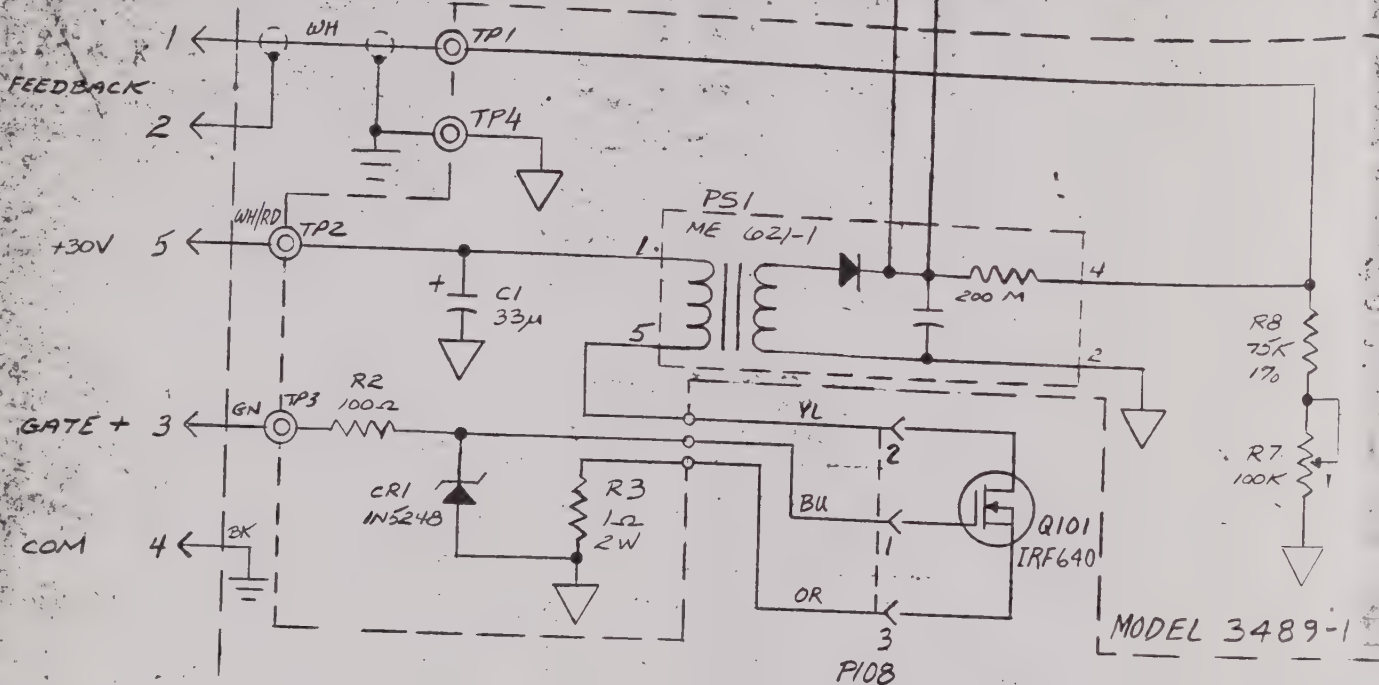
SLY 1-2-84
NW 1/3/84

MODEL 3128-2
SMALL SIGNAL BOARD
FOR MODEL 175

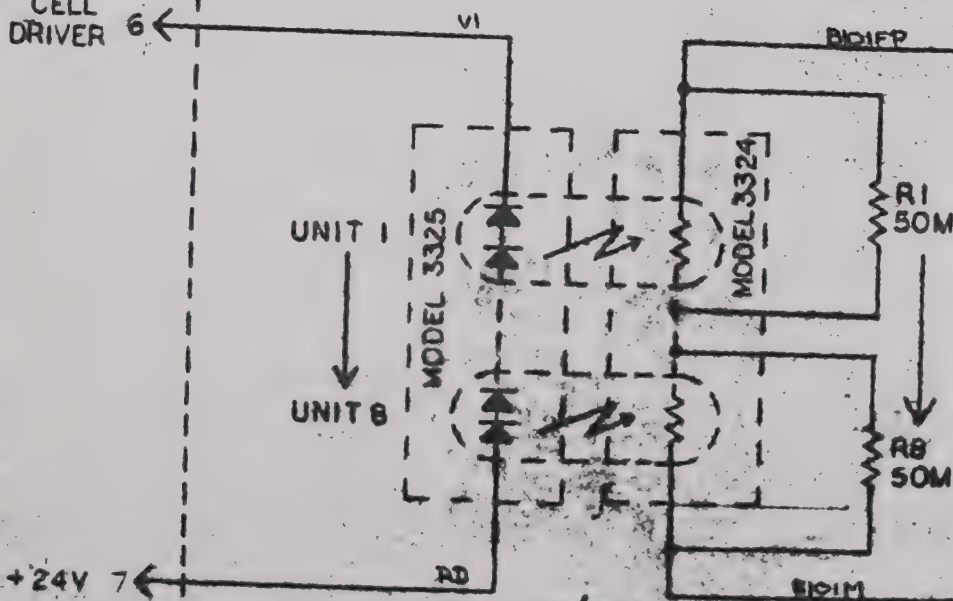
3128-2/22
SHT 1 OF 4

53

MOLEX
03-06-2091
J102



CELL
DRIVER



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 ^ P104

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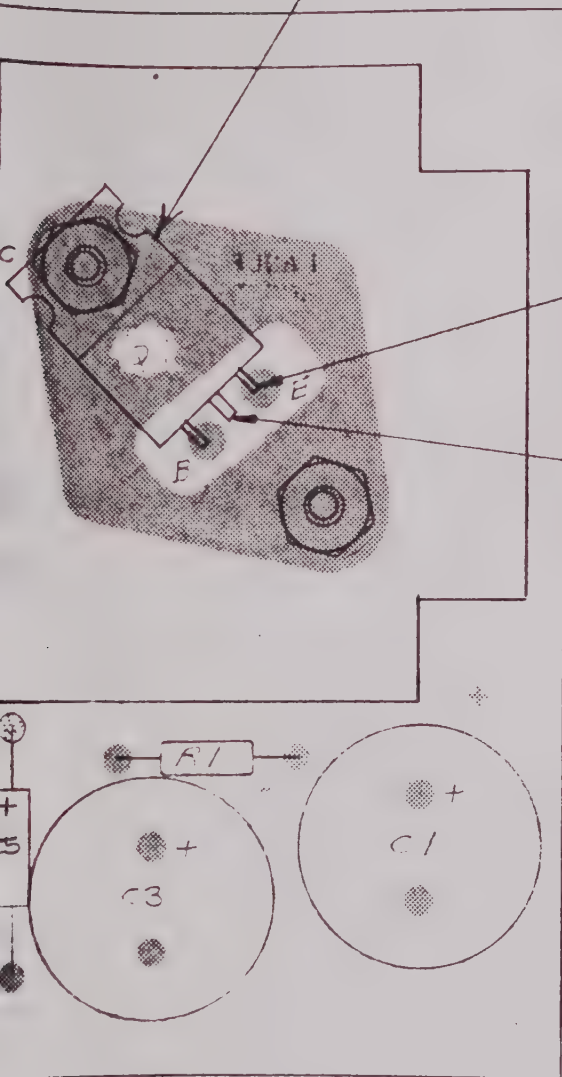
612A-1/1

		LOC.	LET.	REVISIONS		DATE
		SCALE	~	DATE	 MONROE ELECTRONICS, INC. LYNDONVILLE, NEW YORK	
		DRAWN	UG	12-9-81		
		CHK'D.	JLT	11/31/90	MODEL 612A + H.V. SCHEMATIC (PLUS)	
NEXT ASSEMBLY	NO. REQ.	APP'D.	QLP	11/5/90		
TOLERANCE UNLESS OTHERWISE SPECIFIED: DECIMAL ± .005 FRACTIONAL ± 1/16 ANGULAR ± 15°						
MATERIAL						612A-1/1

MONROE ELECTRONICS, INC.
 LYNDONVILLE, NEW YORK

19

USE INSULATOR BETWEEN
TRANSISTOR AND HEAT SINK
TYP 2 PLACES



INSULATE Emitter AND BASE LEADS
WITH 20 GA. TEFLON TUBING (ITEM 18)
TO PREVENT SHORTING TO HEATSINK.
TYP 4 PLACES

CUT COLLECTOR LEAD TO APPROX. 1/8 IN.
TYP 2 PLACES

3140/22
SHT 1 OF 3

A,	ADD ASSY DETAILS	12-18-87	TPM12-17-87
A	C9 & 10 WERE TE'S		BWC 10-1-76

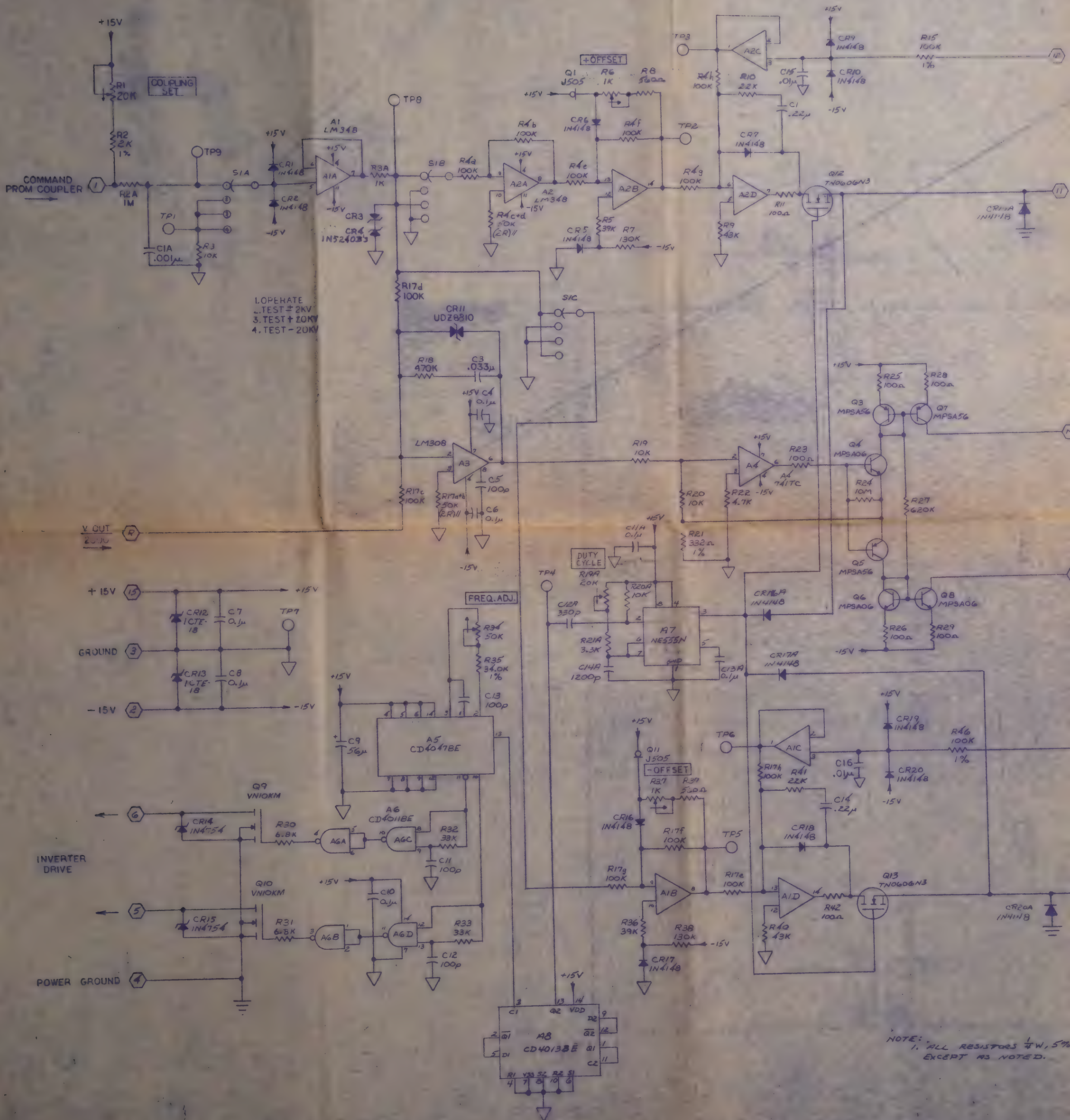
LOC.	LET.	REVISIONS		DATE
SCALE	2 8 1	DATE	M MONROE ELECTRONICS, INC. E LYNDONVILLE, NEW YORK	
DRAWN	MN	23 MAY 74		
CHK'D	✓✓	12/13/87	MODEL 3140 POWER SUPPLY	
APP'D	1/11/87	2/25/87		

TOLERANCE UNLESS OTHERWISE SPECIFIED:
DECIMAL ± .005 FRACTIONAL ± 1/64

ANGULAR ± 15°

MATERIAL

3140/22
SHT 1 OF 3



← FEEDBACK

+ H.V. DRIVE →

← CELL DRIVE

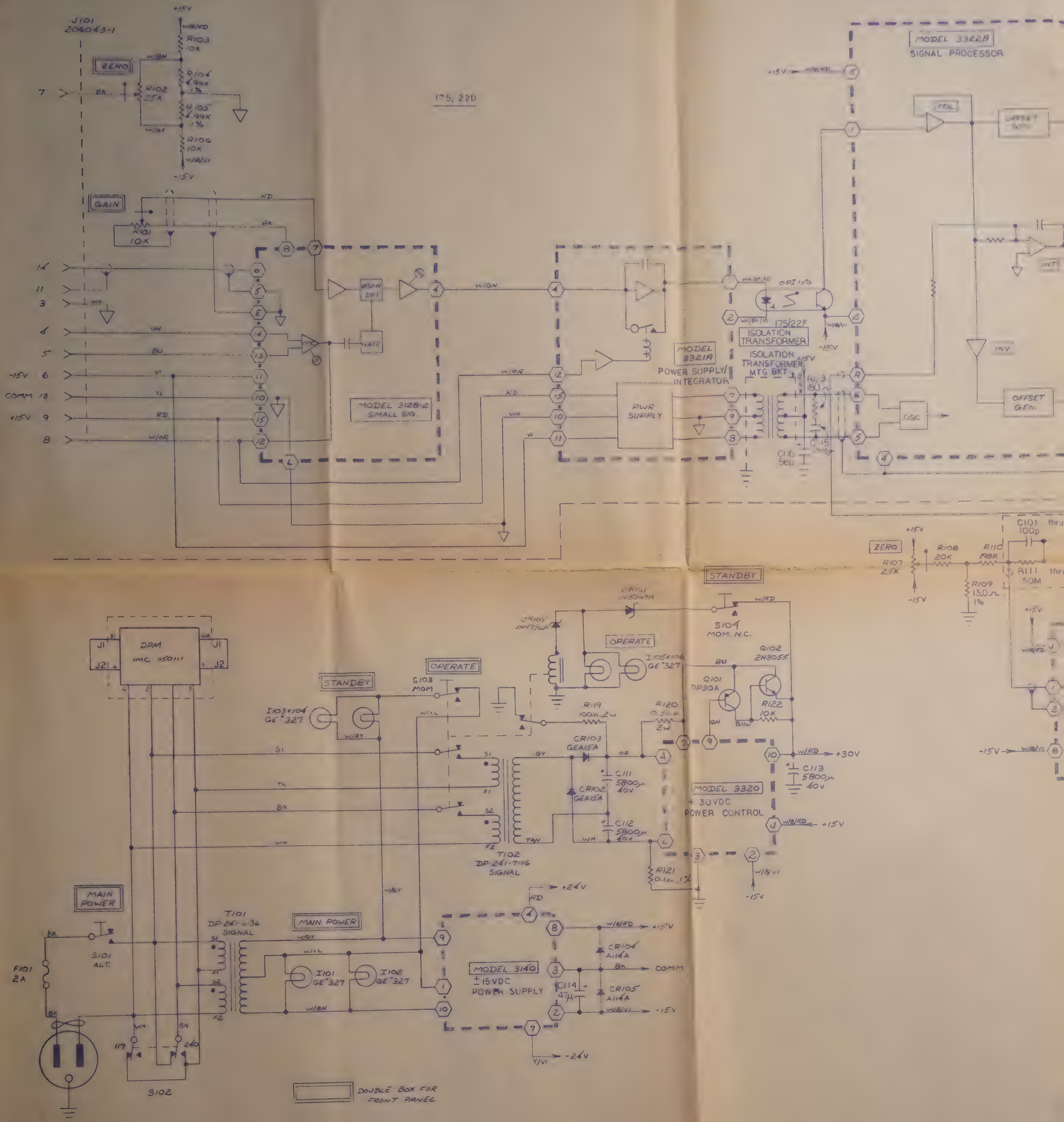
+ CELL DRIVE →

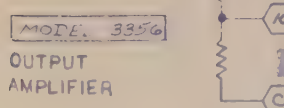
← FEEDBACK

- H.V. DRIVE →

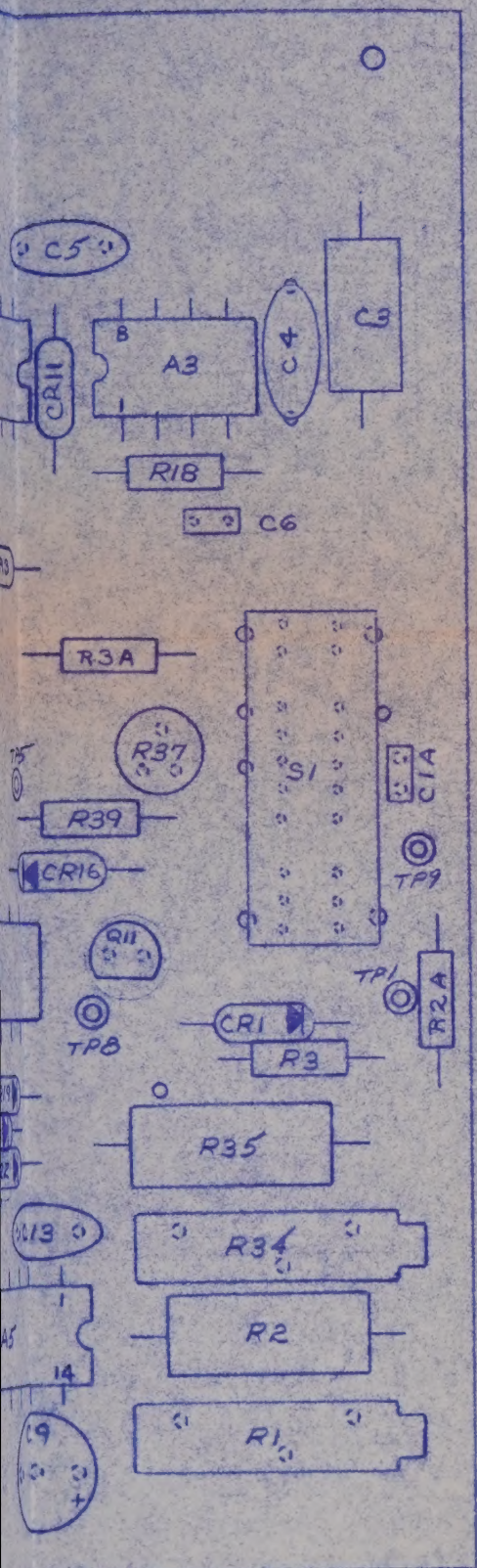
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A		ADD CR/BA, 200, 015		DATE 11/1/90	
LOC	LET	REVISIONS			DATE
		SCALE	~	DATE	
		DRAWN	JN	9/24/80	
		CH'KD	JIT	11/1/90	
		APP'D	CLP	1/5/91	
NEXT ASSEMBLY		NO. REQ.	MODEL 3322B SIGNAL PROCESSOR		
TOLERANCE UNLESS OTHERWISE SPECIFIED		DECIMAL ± .005			FRACTIONAL ± 1/64
MATERIAL		ANGULAR ± 15°			
DRAWN BY 3322B/1					DATE 11/1/90





TOL. UNLESS OTHERWISE SPECIFIED DECIMAL : .005		ANGULAR : 15	
MATERIAL		175/1	



ADD CR10A, R34 AND C10
C12A & C14A REVERSED

		LOC.	LET.	REVISIONS		DATE
				SCALE	2:1	DATE
				DRAWN	TPM	8/26/80
				CHK'D	JT	11/1/90
NEXT ASSEMBLY	NO. REQ.		APP'D			11/5/90
TOLERANCE UNLESS OTHERWISE SPECIFIED: DECIMAL $\pm .005$ FRACTIONAL $\pm 1/64$ ANGULAR $\pm 15^\circ$						
MATERIAL						
MONROE ELECTRONICS, INC. LYNDONVILLE, NEW YORK						
MODEL 3322B ASSY.						
3322B/22 SMT 1-65						8/18/96

